RADIO AND HOBBIES IN AUSTRALIA

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A SPECIAL ISSUE FOR BEGINNERS

RADIO AND HOBBIES IN AUSTRALIA

RADIO AS A HOBBY

AMONG the readers of "Radio and Hobbies" are people of all shades of technical enlightenment. Some are dealers and professional servicemen. Others are old hands, who have tinkered with radio as a hobby for the best part of twenty years; in their letters they refer affectionately to the very early copies of the old "Wireless Weekly." Quite a few of our readers are mere lads, whose piping voices disturb the peace of the office when they come to us for circuits and advice.

Theoretically, at least, the ideal under the circumstances is to arrange each individual issue of "Radio and Hobbies" so that it contains something of interest to everyone. Unfortunately, things cannot always be made to work out that way and we just have to allocate the rather limited space as circumstances dictate.

During the last few months, our more advanced readers have been well looked after. The articles to date on Public Address and the series on the Cathode-Ray Oscillograph have been well accepted and have created quite a lot of interest, to judge by various comments we have heard. Our only regret is that the present shortage of compenents has interfered with the constructional aspect to a certain extent. In fact, this shortage of components is making it necessary for us to devote rather more space to theoretical discussion than has hitherto been our custom.

We feel sure that our advanced readers will understand our motives in devoting practically the whole of the technical section of the present issue to items of particular interest to beginners. While lack of space has rather cramped our style, we trust that the result of our effort will be to encourage others to take up this grand hobby.

Of course, undue emphasis upon hobbies is out of place in the very serious times in which we find ourselves. Our first dutv is to the cause for which we are fighting. After that, it is well to devote our few leisure hours to something that might well serve a useful purpose in the future.

The Allied Nations are not the losers by the fact that thousands of their young men had tinkered with radio in their spare time. Having gained a groundwork of knowledge, these same young men were able, with some additional training, to take over the operation and the maintenance of much of the radio equipment which is part of a modern fighting force.

These things are not said because we have any axe to grind, but simply because we believe them to be true. As a hobby, radio is absorbing and instructive. It is expensive or inexpensive as you make it. It is progressive and expansive. Many build up receivers and pull them down again for no other reason than the pleasure it affords them. Some build them up with an eye to the logging of distant stations; others build up receivers and amplifiers because they want music reproduced to their liking.

The post-war period will be an interesting time for radio enthusiasts. Their number will be swelled by the thousands of young men—and young women—who have been introduced to the technical side of radio as a result of the war. The post-war period will witness tremendous advances, both in the technical and the commercial side of radio entertainment. Television will probably arrive with a rush—most likely television in full color. There will be improvements in existing technique and perhaps frequency modulated transmissions, as already established in USA.

Above all, there will or should be parts in abundance, parts to delight the heart of any radio hobbyist.

W. H. Williams

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THE FINALE TO A MISSION OF DEATH

On the night of Sunday, May 31, a force of Japanese submarines crept stealthily towards Sydney Harbor. With a roar of depth charges and guns of all calibre, the defences went into action. Within a short while four submarines lay inert on the sea floor, a mass of twisted wreckage. Now, naval officers are probing their secrets.

FEATURE STORY

ANOTHER STEP TO VICTORY — THE NEW

David R. Davis at work on the design of a new wing. The derivations of the Davis formula are such that they cannot be plotted as curves by standard engineering methods. A flexible spline, as shown, must be used. Wings designed by Davis showed a marked increase in efficiency over earlier types, derived by cut-and-dry methods.

One of the most vital factors of war in the air is the speed of the combatant planes. The faster they can fly, climb and dive, the more deadly they are in attack, the less vulnerable in defence. Engineers are toiling night and day to produce engines of greater and still greater power, structural outlines presenting less and less wind resistance. But there is that other very important matter of the wing design.

THE performance of a wing is determined not only by its plan form—the silhouette you see when looking at a plane in the sky—but also by its airfoil, the shape of the cross-section showing the curvature of the wing's section.

This story starts in the summer of 1937, when a slight, bespectacled man, with rather bushy hair—the typical crank inventor to the eye—was discussing new airfoil designs with Reuben H. Fleet, president of Consolidated Aircraft Corp., a huge American plane manufacturing company.

The thin man, David R. Davis, was an inventor, and he claimed to have invented a new airfoil design—or, rather, a new concept of airfoil design—a mathematical formula that would determine different and better airfoils than any yet known.

Davis had persuaded Fleet to have his engineers inspect Davis' plans and, in no time at all, the engineers had reported that there was nothing in the idea. As the suggestion that a new, improved airfoil plan could be designed sounded completely screwy, Fleet had had no hesitation in accepting his engineers' condemnation of the plan.

Davis, not very hopefully, suggested that he might have a few words with the engineers who had so quickly buried his idea and, more to fill in time than anything else, this had been arranged.

Hours later, Davis was still in a huddle with the engineers, foiling their attempts to trip him with engineering lore. In turn, he was earnestly questioning their engineering bible—all the books, in fact, on airfoils and streamlining. He reminded them that the science of aerodynamics was based on a theory, the supposition that an infinitely thin sheet was the perfect streamline, offered the least resistance, or drag, in a flow of air.

The theory had been taken for granted so long that it was accepted as a fact. Almost forgotten was the unscientific gap between the straight lines of a thin sheet and the curved lines of a workable airfoil. Wasn't it barely possible that aerodynamics was based on a false hypothesis?

Davis maintained that a thick body, such as a teardrop streamline, if properly curved, would offer the same zero resistance. His formula, starting from a circle, projected this perfect, teardrop streamline, and derived from it airfoil sections that were mathematically perfect. The engineers listened, but were far from convinced.

The efficiency of a wing is usually defined as the ratio of the lift it gives to the air resistance or drag, as it is called, or expressed as a fraction Lift/Drag or L/D. This is not a constant for any wing, but varies with the angle of incidence.

This latter is the angle at which the wing meets the air coming to it, and is usually measured by placing a straight-edge along the bottom of the wing section, and noting the angle this straight-edge makes with the course of the aeroplane.

As one would expect, the lift of the wing varies considerably with this angle and, with the ordinary cambered wing, the lift does not fall to nothing until the incidence measured in this way falls to minus six or seven degrees, though the precise figure varies with the shape of the camber.

STALLING ANGLE

From this point, the lift of the wing increases, until one reaches a positive angle of incidence of perhaps 15 or 16 degrees, when it begins to fall off again, the angle at which the lift begins to fall off being called the stalling angle.

It is a critical point, because, at the stalling angle, a change of the flow around the wing takes place. Instead of the air flowing smoothly and steadily over the upper surface of the wing, it breaks away, leaving a space above the wing which is full of vortices.

All known airfoils are given distinctive names, or numbers. Graph No. 1 shows what is known as the Clark Y—a section of medium thickness, much used for biplanes, and sometimes for braced monoplanes.

Graph No. 2 is a symmetrical section known as the RAF30. Sections of this sort are used for tailplanes, elevators, and wings. Adjacent to each section is a chart showing the characteristic curves of the section.

They are all plotted against angle of

by

L. B. Montague

DAVIS WING GIVES HIGH PERFORMANCE

incidence, and represent (i.) the lift curve, which shows the variation of lift; (ii.) the drag curve, showing how the resistance of the section varies, and (iii.) a curve of L/D or Lift/Drag. A further curve shows the centre of pressure variation. Naturally, the curves differ for the various airfoils.

The symmetrical section has the smallest resistance or drag at small angles, while the Clark Y has the best L/D. The numbers given for the lift and the drag are given in what are called "absolute" coefficients, and require multiplying by the area of the wing, the square of the wind speed (in feet per second), and by the density of the air, or 0.00237, if it is desired to find the actual lift of a wing in pounds when speed is given in feet per second.

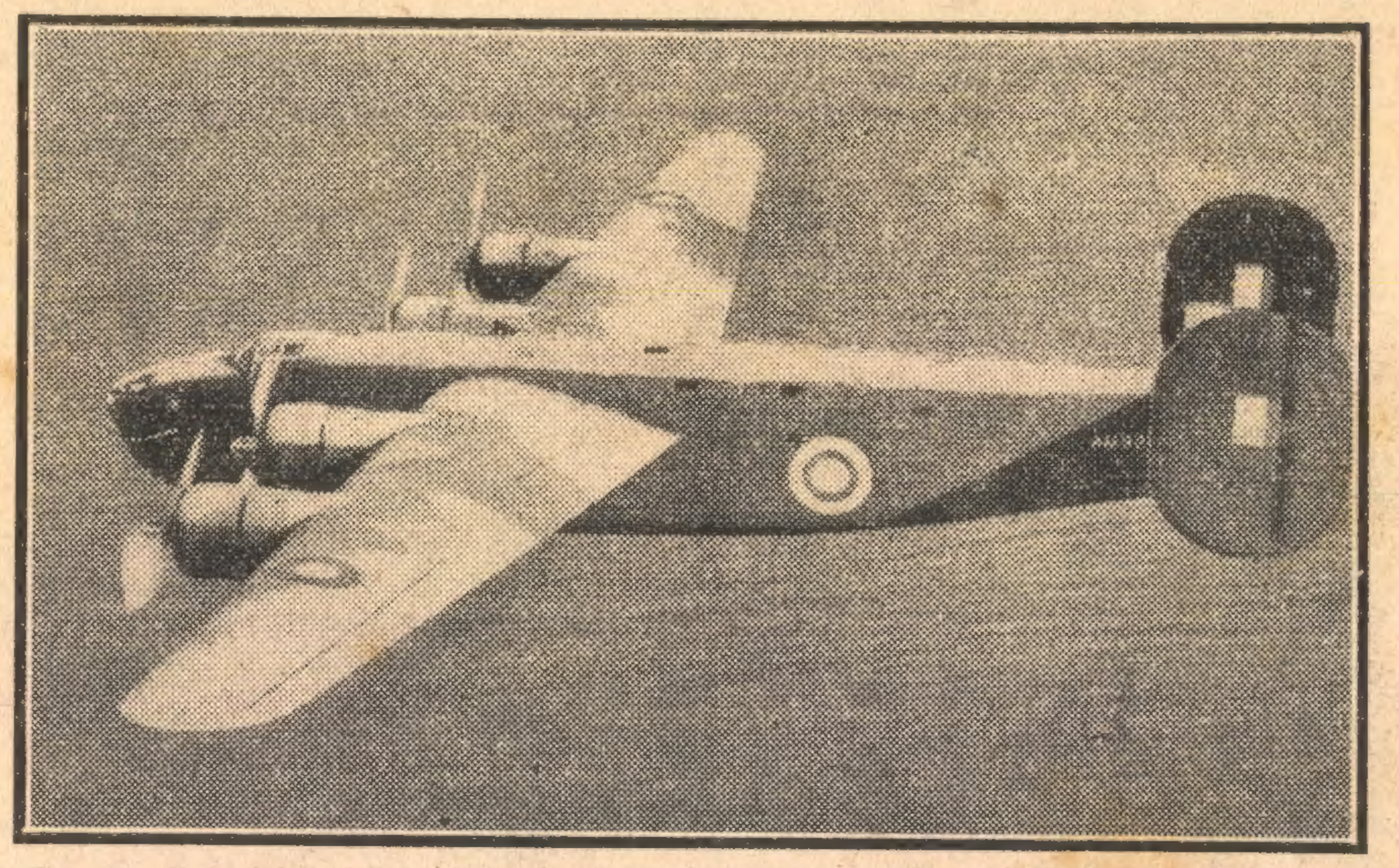
CUT-AND-TRY METHOD

Countless airfoil sections have been built into full-size planes, or have been painstakingly built into model wings, and tested in wind tunnels to find how they react in a flow of air.

The findings of years of cut-and-try experimenting, at a cost of millions, were thought to have covered the field of practical possibilities. The results, supported by precise and complete mathematical equations, had given aerodynamics its rating as an exact science. It was all a hit-or-miss procedure, Davis told the Consolidated engineers that afternoon—one that could never find a perfect airfoil section.

After further thought, the chief engineer reported that he thought the Davis formula was worth a try. A huge flying boat was in the drawing-board stage. They decided to give Davis the plan form of the wing and let him build his airfoil section into a model wing, to be tested against the model of their own wing.

A model wing costs about £100, and wind tunnel tests a similar amount, and it was only after further consideration that it was decided to risk these amounts. It seemed a waste of time and money, though, for the wing intended for the flying boat was thought to be about 2 per cent. more efficient than any other known wing. That slight improvement was remarkable enough to be kept a secret.



The new Consolidated B-24 "Liberator" bomber owes something of its high performance to the special wing designed according to the Davis formula. Powered by four Pratt and Whitney engines, each developing 1200 horsepower at take-off, these huge bombers will play a vital role in the developing Allied air offensive.

WIND-TUNNEL TESTS

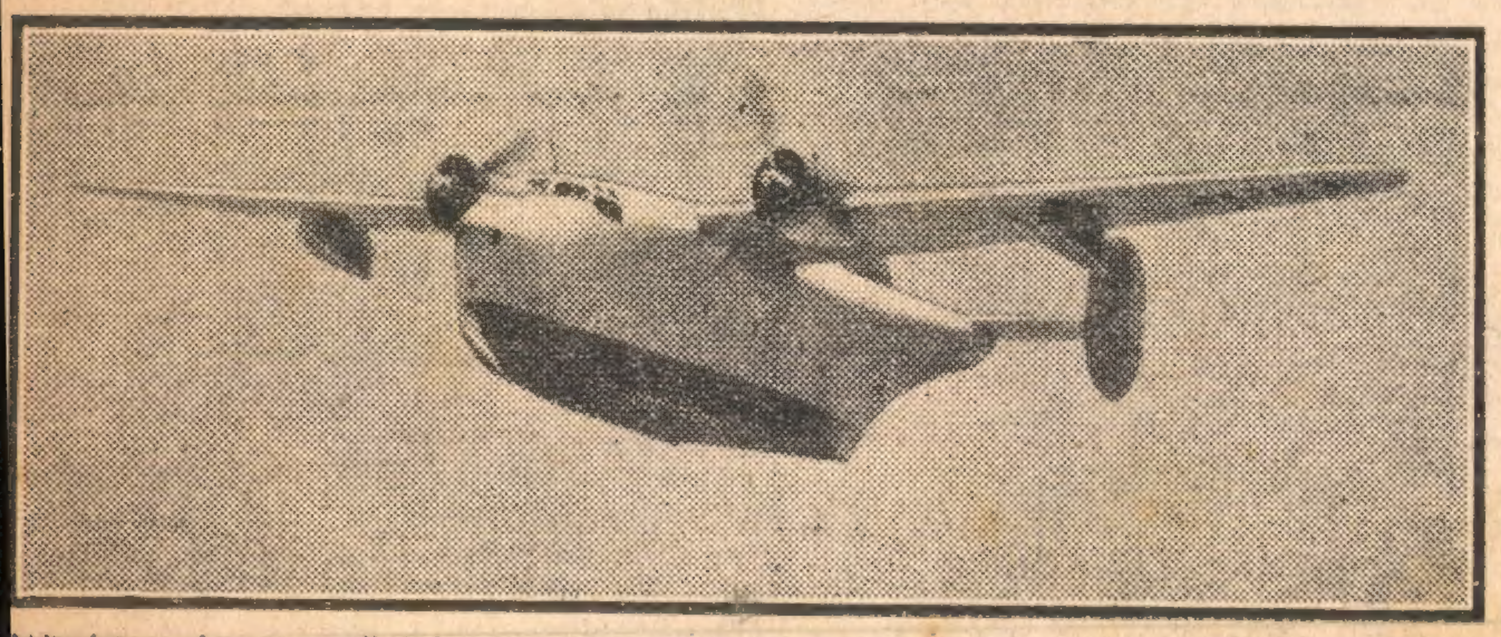
On the kitchen table of his apartment in Los Angeles, Davis applied his formula to laying out the airfoil section. In seven years of developing and proving the formula, this was his first chance to test it in a complete wing. He had the eight-foot wooden model built, and brought it to the wind tunnel of the California Institute of Technology.

A wind-tunnel test can be completed in a matter of hours, a day or so is required for calculating the results, and the completed report can be expected in about one week—a period Davis spent in biting his finger-nails. Then his wing was returned to him, but he was told his report was not ready.

Another week passed, and Caltech asked to have the wing for further tests. When it was returned, Davis was told vaguely that something was wrong, a little trouble with the wind tunnel. More weeks passed, with Davis still unable to learn anything.

Caltech seemed to be stalling for time, but they weren't. The entire wind tunnel department was very busy taking their tunnels apart, and examining them minutely, because something was obviousy wrong. The tests of the Davis wing were scientifically impossible.

Heretofore, wings that tested 90 per cent. efficient were thought to be mighty good, and the Davis wing had consistently reached 100 per cent., which, mechanically, meant perpetual motion. When no error could be found in the wind tunnel, Caltech finally released a rather bewildered and uncertain report, that amuses Davis by remaining, to date, the only recognition he has received from the slowly-grinding mills of science.



Wind-tunnel tests still left the experts suspicious of the claims made for the Davis wing. However, its efficiency was proved when this 52-passenger flying boat took off from San Diego Harbor in May, 1939, and bettered by 20 per cent. all former standards of performance.

INDECISIVE REPORTS

One statement read, "The remarkably high value of the Davis wing is probably associated with a peculiar variation of boundary layer thickness with angle of attack, but no real explanation of it has yet appeared." In general, the report conveyed the impression that the Davis wing was a freak, not altogether to be trusted.

The scientific dilemma of the professors was nothing to the problem that confronted the aeroplane manufacturer. He had to decide on the evidence of the rather bewildering technical report whether to use the Davis wing on the new flying boat.

There is always an indeterminate margin of error between model and full-

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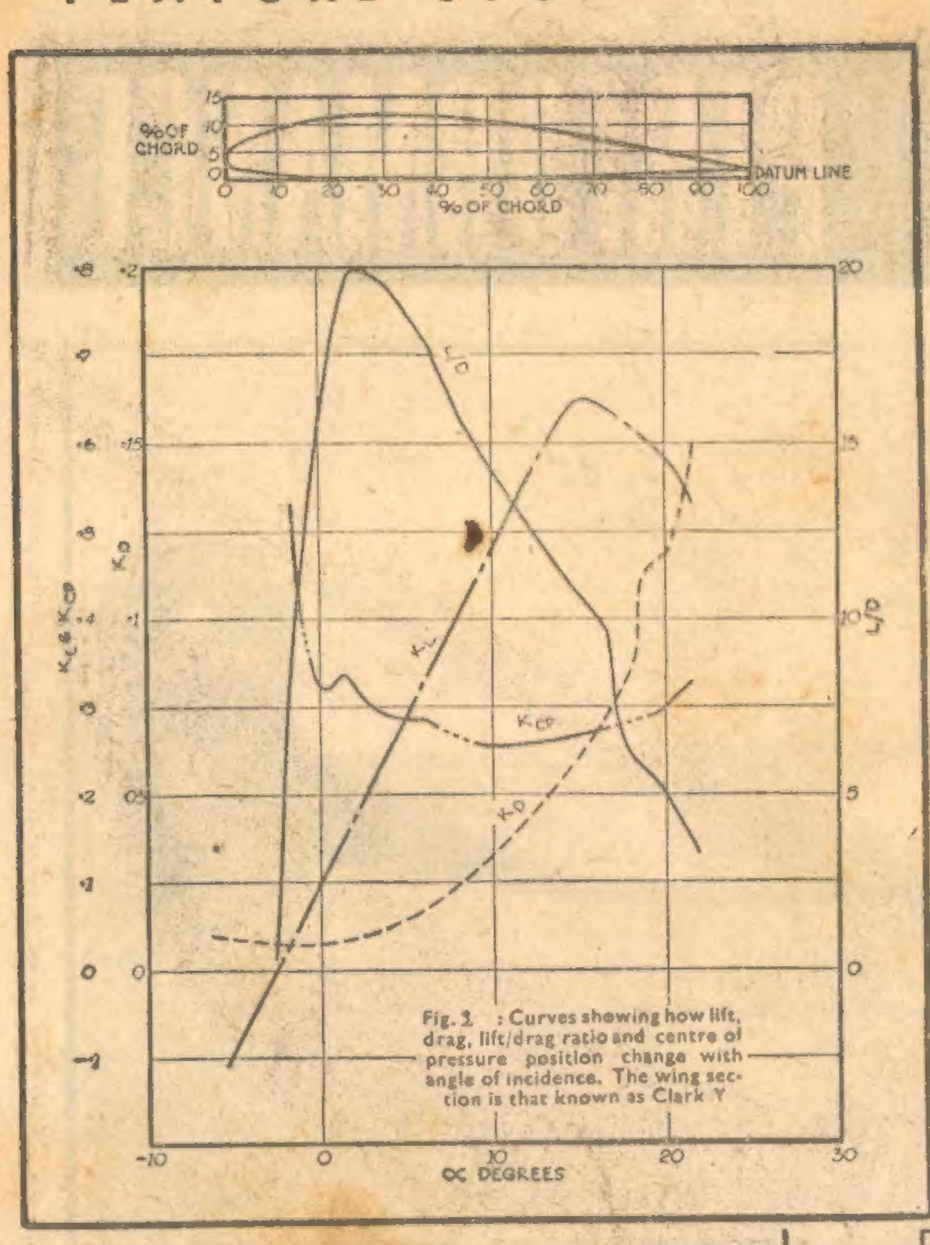
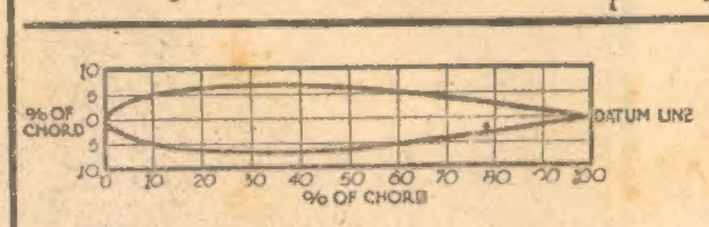
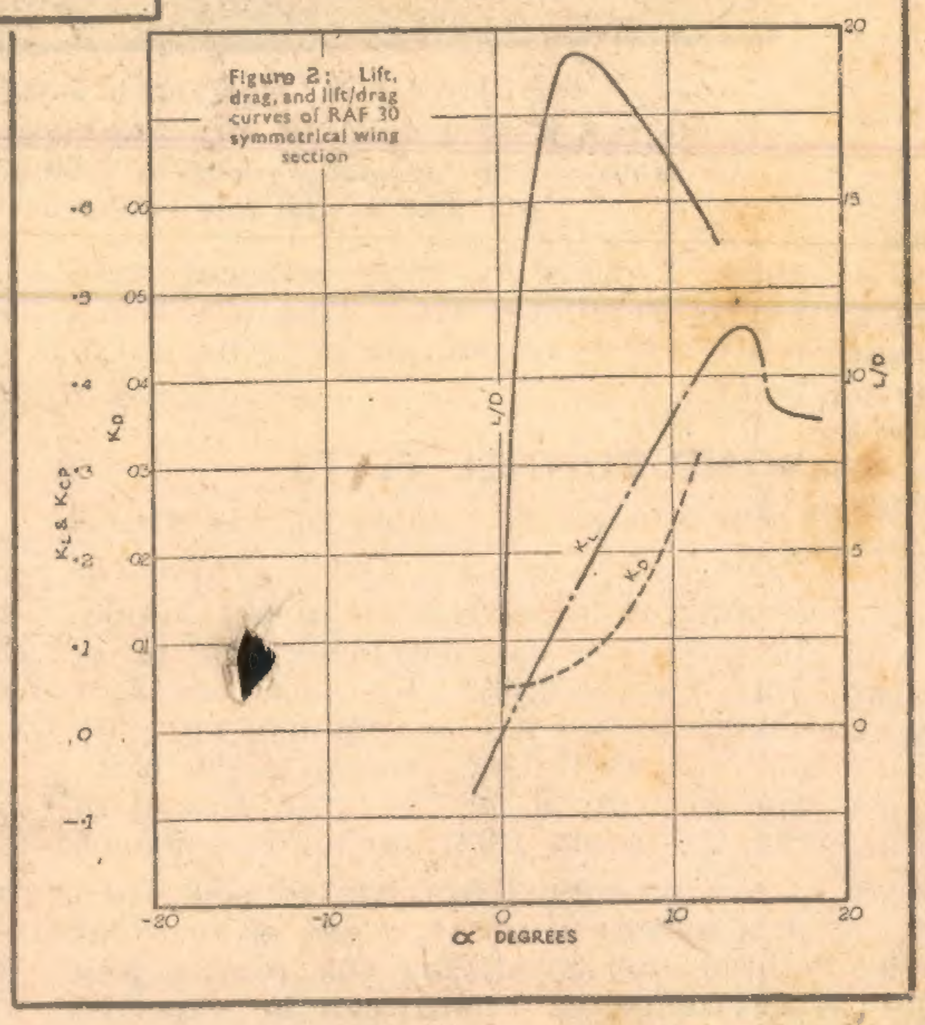


Fig. 1 : Curves showing how lift, drag, lift/drag ratio and centre of pressure position change with angle of incidence. The wing section is that known as Clark Y

Illustrating on the left the Clark Y airfoil section and, below, the airfoil section known as RAF30. The curves below each section show (1) the variation in lift; (2) the drag or resistance; and (3) the lift/drag ratio, each value being plotted against the angle of incidence.





scale performances. If the Davis wing had some error, some "peculiar variation," he didn't want to find it out in a prototype that would cost a million dollars to build.

When the Davis wing had been patented, and the manufacturer, with many misgivings, had decided to go ahead with the plan, legal negotiations were started to reach a royalty basis. The contract was finalised with a royalty beginning at ½ of 1 per cent. of the selling price of each plane built using the Davis airfoil, which is not as small as it sounds, in view of the fact that each of the planes in production would sell for some 225,000 dollars each.

ACTUAL TRIALS

A clause was incorporated in the agreement to keep the deal a secret for one year, largely because Consolidated Aircraft's agreement did not give them exclusive rights. Thus, the full impact of the Davis airfoil on the aeronautical world was not felt until more than a year later, when the huge flying boat was finally completed.

In early tests, it bettered by more than 20 per cent. all former standards of performance, and reached an easy top speed of 275 mph, as compared to about 175 mph for other types of Clipper flying boats. It had been designed for possible use as a bomber, and this was a point the Navy was quick to appreciate. Speeds were said to have gone above 300 mph, and a cruising range of 10,000 miles was proved before further figures became a Navy secret.

Davis had completed his formula only after years of heart-breaking work and almost an entire lifetime spent in the aircraft field. Davis had made his first flights in 1915, at the age of 20, when he and a friend, Grover Bell, had bought a bamboo Curtiss with a three-cylinder motor.

Grover Bell was the ace pilot because he could make turns. Davis could fly only in straight lines. Bell's younger brother, Lawrence, was not permitted a fly, a frustration that might account for the fact that Larry Bell is now the manufacturer of the famous Bell Airacobras.

Later Davis experiments included buying another plane, and even setting a record when he was blown backwards all the way across Death Valley. When the gas ran out, the forced landing wrecked the plane. Ideas which had been forming in Davis' mind for a better plane, led him to form the Davis-Douglas Company, which has since become the world-famed Douglas Aircraft Corp.

The result of the Davis-Douglas co-operation was the Cloudster, the first plane to use thick wings. Current opinion was that the plane would not even fly, but the Cloudster set a world's altitude record for unsupercharged motors.

EARLY EXPERIMENTS

Their first attempt on the American coast-to-coast record was ruined when the motor blew up, and the second when someone put sugar in the gas tank. The next development of Davis-Douglas was the Navy's first torpedo plane. But before it became standard, Davis left the company, which had swallowed the larger part of his available capital.

Davis' interests turned more exclusively in the direction of invention, and he spent several years experimenting with a variable-pitch airscrew. A possible relationship between a propeller (or airscrew), and a wing slowly assumed a significance he knew had not been generally recognised by the aeronautical profession.

A propeller is a wing that creates force by its revolving action, a fact that was universally accepted. A wing, however, was thought of as a passive instrument, that was pulled through the air without generating any active force of its own. Davis began to ponder the thought that a wing speeding through the air might have a positive moving action that only seemed passive because it was held inactive by the plane's controls.

He knew that when smoke was used in a wind tunnel to make air currents visible, and a wing was suddenly pulled out lengthwise, the smoke showed that air currents had been set revolving around the space where the wing had been. Davis reasoned that this meant a wing had a rotating tendency that transferred its force to the air—an action that, if freed from control, would allow the wing to spin on its longitudinal axis rather like a rolling pin.

BASIS OF THEORY

This rotating action, to be smooth, would require an even centre of pressure, or axle. The rim, or wheel, formed by the revolving wing must therefore be round. This logical hypothesis suggested that the basis of mechanical development, the wheel, might somehow be applied to airfoil design.

The accumulated knowledge of years of flying and wind-tunnel tests that had lifted aeronautics from the level of experiment and experience to the recognised science of aerodynamics, had no such basic principle. A rule of thumb method had been used in shaping airfoils, a whittling process, that cut a slice off here and added a slice there to see what would happen.

INEFFICIENT WINGS

The best airfoils fashioned by this method were only about 90 per cent. efficient—that is, about 90 per cent. of their reaction to an airflow was lift. The 10 per cent. loss was ascribed to irreducible resistance, and skin friction known technically as drag.

According to the experts, the limits of efficiency had been reached—there just wasn't any more to be learnt or done about airfoils.

Davis suspected that a wing's 10 per cent. loss of efficiency was due to the fact that "whittled" airfoil sections were improperly curved to produce a theoretically smooth rotating action. As long as a wing was considered an inactive instrument, this unevenness would remain undiscovered, except as a

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"HOW IT WORKS"—BY R. M. YOUNGER

YOUR VACUUM CLEANER

Those useful household gadgets, vacuum-cleaners, vary considerably in the detail of their construction and appearance, but their component parts, and the principle upon which they all work, are fundamentally the same.

THE idea behind the machine is that an electrically-driven fan creates a current of air through the channels of the machine. One end of the channel is formed into a nozzle-shaped mouth which comes into contact with the surface from which the dust is to be removed.

The partial vacuum set up by the air, draws the dust into the vacuum-cleaner, and here a fine-mesh cloth filter-bag catches the dust and grit as the air current passes out through it. The filter-bag may be exposed or may be enclosed in a rigid container.

BRUSH AGITATOR

Some vacuum-cleaners are fitted with moving brush agitators to dislodge dust which may be too ingrained to be drawn out by suction alone.

A machine of this type is shown in semi-diagram form at the top of the picture. This particular type of machine is very compact, as can be seen. The front of the machine is a wide nozzle in direct contact with the carpet or floor; the back is set on wheels to facilitate movement of the machine.

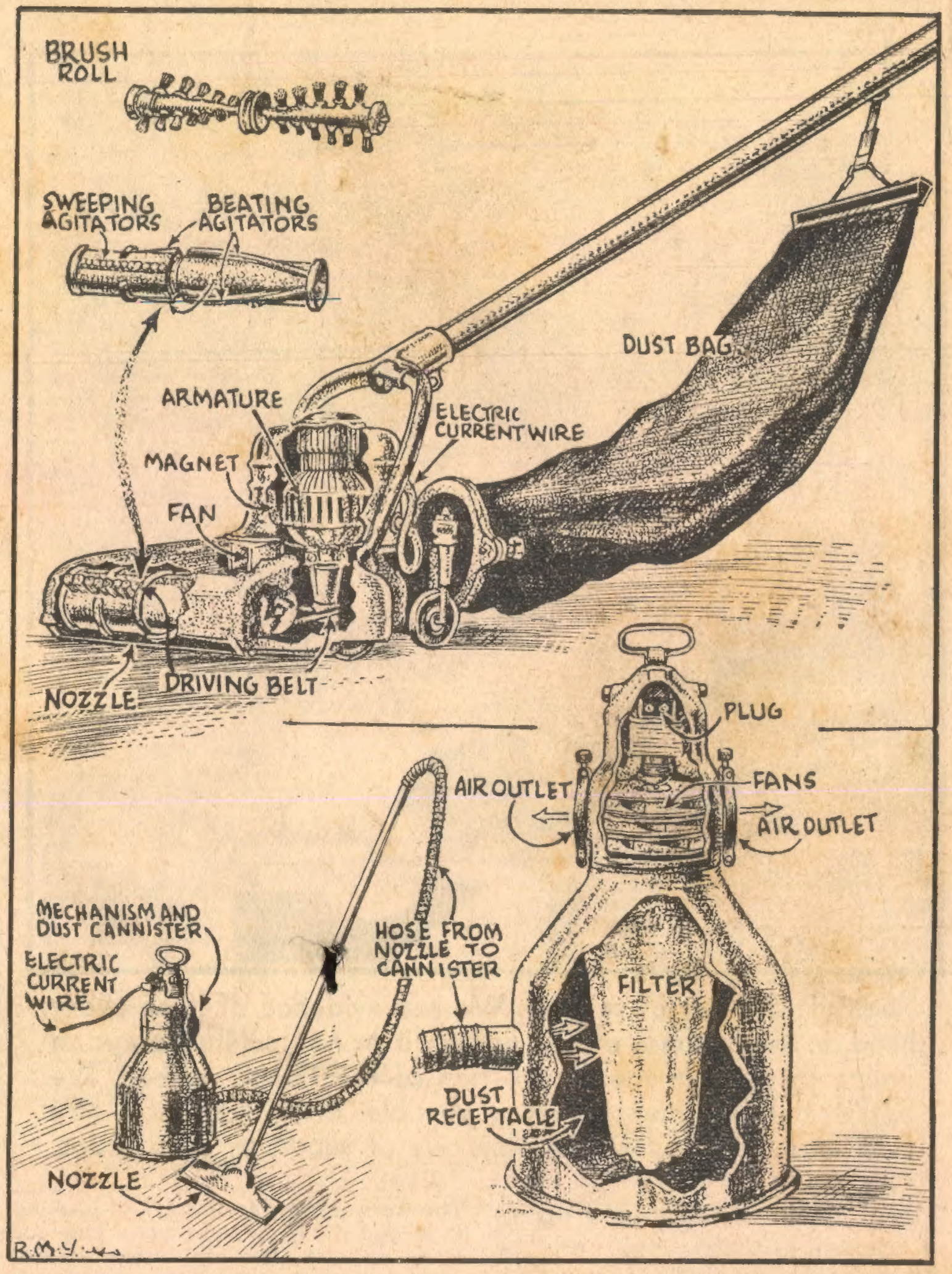
When the machine is working, air is drawn in through the nozzle and expelled through the fine mesh of the dust-bag, which is supported on the handle. The dust-bag is made of fine fabric, which traps the dust and fluff, allowing only cleaned air to pass through. The bag can be detached and emptied, when necessary.

ALTERNATIVE TYPE

Shown in the lower part of the sketch is a larger type of vacuum-cleaner. The dust receptacle is a fairly large drum-like vessel, which is left in one position while the handpiece and the nozzle are attached to the receptacle by a pliable hose. This style of machine is used largely in commercial establishments and in theatres.

The dust and fluff-laden air is drawn into the dust receptacle, where the filter catches it. Only clean air is drawn through the filter, past the fans, and then out through the outlets on each side of the upper part of the machine.

The vacuum-cleaner makes it possible to gather the dust from a room and carry it outside and represents a great advance on the broom and feather-duster. These merely cause much of the dust to rise, only to settle again later.



DRYING PAINT BY INFRA-RED RAYS

A NEW trick, used in some US factories, is the drying of paint by infra-red rays in twelve minutes to a finish so tough that it will take the pounding of a machinist's hammer without cracking. An automobile manufacturer started it about five years ago when he used it first to touch-up painting on car bodies damaged in shipment. Subsequently he used it for finishing entire bodies.

The process consists of passing painted articles slowly through a tunnel of lights, principally carbon filament lamps, which give off infra-red rays. Whereas glass often cracked under the old method of baking in an oven, it passes through the lights tunnel without harm.

The process is being used by one Baltimore company to finish jackets for heating furnaces in panels about four feet by two.

THE CHEMISTRY OF COOKING — LEARN

Today is the day of science. We see evidence of it on every hand, in every phase of life. Believe it or not, science plays an important part in the formulation of the things we eat. The application of science makes possible those light and airy creations which adorn the windows of suburban cake shops.

TRULY the cook mixes up so much of this, that and the other, beats it together in a prescribed fashion, puts the result in fancy tins and then cooks it for such and such a time at a certain oven temperature. These things are done from habit or the recipe book, as the case may be, but no thought is given to the scientific basis for the various operations.

This should not be. For while it is admitted that it is not necessary to understand the technical side of a machine in order to learn how to operate it, we would be better operators if we did and we would be more able to contribute something of our own.

Better motor-cars are not produced by mere drivers, but by those who understand the theory of motor engines

The same applies to the art of cooking. It is one thing to make good pies and cakes on occasions and other articles of the culinary art; but it is not always easy to make them consistently good.

It is easy to say to a ravenous husband, "I don't know what went wrong with the scones this time; I used the same flour, &c." But this doesn't always go over when the "old man" has either to starve or to go out to the woodshed and bring in the axe with which to crack his food.

He may think a lot more of you if you were able to say, "You see, darling, what happened was this: I mixed the flour with milk and was just going to stir it when the insurance man came to the door. Now from the time I added the milk to the time I was able to come back and stir it into the flour was about five minutes. ("More like 15 minutes, I bet," says your hubby.) This allowed the milk to work on the top of the flour, and so this part of the flour was activated before the rest of it. Consequently, when I put it into the oven the carbon dioxide was not given off evenly and the scones were of an uneven texture. Isn't that wonderful?" "What is?" says hubby. "Knowing why!" say you. "You're telling me," says hubby, "but when do we eat?"

Don't be discouraged at this, but just remember that, if you do know why these things happen, you have a much better chance of making good scones all the time than the woman next door, who has not the faintest idea what happens.

Calvin Walters does not infer that Australian housewives cannot cook. Far from it! But he does believe that those responsible for our gastronomic requirements could well be a little more chemically minded.

I read somewhere that the world can be divided into three great classes. The few who make things happen; the many who watch things happen; and the great majority who haven't the faintest idea what happens. Always try to emulate the first class and indigestion and domestic worries will be less frequent.

Take, for instance, the following questions bearing on dough. I chose dough first, as it is the basis of most of the cooking done in the way of cakes, scones and all pastry. At least, I have never heard of anybody making pastry without dough, although I have on occasions tasted some that seemed to have sawdust, sand and used tobacco as the principal ingredients.

CAN YOU ANSWER THESE?

What is the main cooking value of flour? On what does the lightness, toughness and palatability of dough depend? Why does dough rise if made from self-raising flour or with baking powder?

What are the factors that cause a cake to fall during baking? If a biscuit is being made from a baking powder mixture, what happens if it is excessively beaten?

What constituents of dough help in the browning of the baked product? Aside from sweetening, what is the action of sugar in a cooked dish?

If you can answer all these you get top marks. If you can't, then here are the answers. You will understand from this why a little knowledge of the whys of cooking can be really helpful.

by Calvin Walters

WHY CAKES RISE — OR ELSE STAY FLAT

What then is the main cooking value of flour? Simply that it is a means of holding all the other ingredients together. Flour consists of starch, proteins, gliadin, glutenin, &c.

The starch is capable of holding large quantities of water when it is heated. The proteins, glutenin and gliadin, unite and form gluten. Gluten also is capable of absorbing large quantities of water and, as it coagulates when it is heated, it gives form to the finished product.

FLOUR VARIES

It can be seen from this that this is a rather important matter, for the starch and gluten content of different flours may vary. Thus, a cup of flour mixed with half a cup of milk may give a stiff dough at one time and a thin dough next time you use the same recipe. Simply because the flour came from a different grade of wheat each time.

So it is important to know just what kind of a dough is actually called for in the recipe, a stiff dough or a thin dough. Once that is determined, the milk or water content can be adjusted for the particular flour in use at the time.

A recipe which simply states, say, one cup of flour and half a cup of milk is not as reliable as one which says to make a stiff dough or a thin dough, as the case may be. That is number one, for the time being. Learn it and put it over Mrs. Jones next door.

QUALITY OF DOUGH

Number two. On what does the lightness, toughness, and palatability of a dough depend? On the amount of gluten developed.

It is the gluten which gives us that sticky mess when the flour is mixed with liquid of some sort. You have noticed that the longer the flour is mixed with liquid the tougher the mixture becomes. This is brought about by over-development of gluten. The result of over-developed gluten is to make a heavier and more solid baked product.

The reason for this lies in the fact that the gas formed in the mixture during baking finds it harder to stretch the tough, elastic-like bands formed by the gluten. If steam does happen to force its way through the mixture, the baked product contains a few large holes like tunnels.

BLAME THE GLUTEN

If, therefore, your little boy asks you for a piece of your dough with which to make a catapult, you can blame the over-development of gluten as the cause of your embarrassment.

Tough cakes can also be caused by an over-developed gluten, owing to the fat which would usually separate the particles of the cake being absorbed by the gluten. So remember this, unless your cutlery is always kept in the sharpest condition.

A pair of hands and a lump of dough. Too much mixing causes over-development of the gluten. Result — the finished product is tough and probably perforated with unsightly tunnels.

It is necessary to take care to make only enough gluten to give shape and a certain amount of elasticity to the finished job. The quality of a baking powder or self-raising flour also affects the stickiness of the cake. Too much acid or too much alkali, like soda, softens gluten so that the finished product may lack volume and appear sticky and moist.

Question three. Why does dough made from self-raising flour or with baking powder rise during cooking?

In effect, self-raising flour and baking powder are the same. Baking powder is a mixture of baking soda and some acid ingredient. It is necessary to mix this with flour. Self-raising is simply flour already mixed with baking powder.

When an alkali like baking soda comes into contact with an acid like cream of tartar or citric acid in the presence of moisture, inter-action takes place and a gas called carbon dioxide is given off.

This is the gas that bubbles in soda water or lemonade or beer, when one can get it. It is also given off at political meetings and is the cause of the room getting "stuffy." Everybody yawns, and the speaker thinks he is boring you, which he probably is. Now, where was I? Oh, yes, about this Carbon Dioxide.

CARBON DIOXIDE FORMS

When you add liquid to the self-raising flour or baking powder and flour mixture, carbon dioxide begins to form. This action takes place during the cooking process, so that the mixture becomes full of little bubbles.

The heat hardens the mixture around the bubbles and you have a sponge. I have it on good authority that baking powders and self-raising flours will eventually be off the market owing to the difficulty of obtaining raw materials. It will then be necessary to use some substance, such as yeast, to do the leavening for you.

Hold hard, now. It is no use you running off to the grocers and start hoarding baking powder or self-raising flour, because they don't keep, so you will only be wasting your money. One of these days, if you want to know how to use yeast, which will always be ob-

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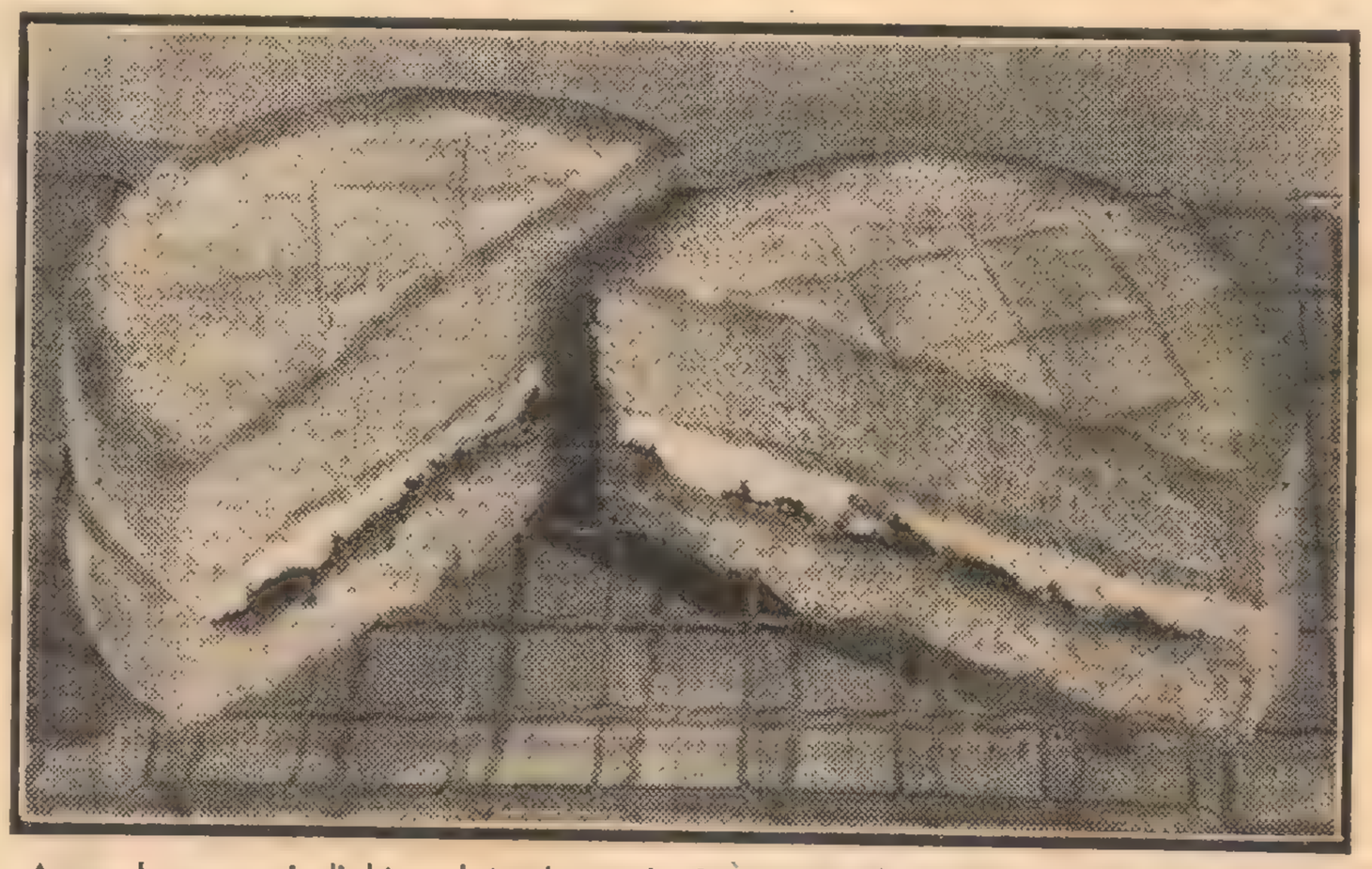


A good sponge is light and tender and of even texture. If your next product has just the opposite characteristics, it is not a case of bad luck. It is simply because of over-developed gluten, too much sugar or some other such reason—if that is any source of comfort to the housewife or to her hungry husband.

The temperature of the oven has a lot to do with the quality of the finished product. Everyone knows that! Once again, there is a logical chemical explanation, which involves a discussion of carbon-dioxide bubbles.

tainable, I will let you in on the ground floor, so to speak.

What are the factors that cause a cake to fall during cooking?

In order to explain this, it is necessary to state that fat is almost always incorporated in the recipe of cake and pastry. It may be in the form of butter or dripping or suet or oil. The presence of fat makes the product tender by causing a separation of the particles of the mixture by a film of the fat.

If the fat is absorbed by the other ingredients instead of merely surrounding them, then the cake or biscuit will not be "just what the doctor ordered."

To get back now to our question. If too much fat is incorporated in the recipe, the surplus fat melts and thereby softens the mixture. The gas that is formed during the cooking process escapes too rapidly, before the dough has set. As a result, the cake falls and turns out a dud.

EXCESSIVE SUGAR

Another reason for a fallen cake is the addition of too much sugar. The development of gluten is retarded by the presence of sugar. Thus, as the structure of a cake depends on the gluten, it is obvious that if too much sugar is added, the cake will be deprived of this structural requirement and it will fall.

If you remember what was said about the over-development of gluten by too much mixing, it can be seen that the remedy for the addition of too much sugar is often found by beating the mixture a little longer than normally. Which shows the value of putting two and two together.

There is a little stunt that a member of my family used to carry out. This particular relative liked a soggy cake. The stunt was that on cooking days, usually on a Saturday afternoon, this fellow would hang around the kitchen until the cake was put into the oven. Timing things to a nicety, and waiting till the cook's back was turned, he would open the oven door. Of course, you know what happened. Down would go the cake, and he could then spend the evening gorging the product of his low action.

The reason for a cake falling under these conditions is as follows: Hot air expands, and cold air contracts. This is a well-known phenomenon. On opening the oven door, the cool air enters, and those nice hot bubbles of gas in the cake immediately contract and down she goes.

Question five. If you were making a biscuit from a baking powder mixture, what will happen if you beat it too much?

COOKING BISCUITS

A recipe for a biscuit usually has a lower fat content than pastry. It is not subjected to as much mixing as pastry. Thus the gluten content is lower. The resulting biscuit is flaky and tender and does not rise because the gas given off by the action of the baking powder escapes through the layers of melted fat.

If, however, a more thorough mixing is indulged in, more gluten is formed, which absorbs a greater amount of the fat, as stated above, and the mixture is tougher. Thus the gas cannot escape so rapidly and the biscuit rises.

To carry the process a stage further, if the mixture is beaten too much, the gluten becomes over-developed and too tough for the gas to raise it and the resulting product is tough and heavy, becoming the subject of derogatory jokes on the part of the family circle.

What constituents of dough cause it to brown when baked? In addition to the sugars formed by the starchy content of flour, there is usually sugar added to cake recipes. It is this sugar which increases the tendency of the dough to brown. It is referred to as caramelisation.

All good cooks know what happens when you burn sugar. It is sometimes done deliberately, being then added to gravy to make it look what it is not.

The same process takes place with the sugar added to a recipe. The action of the heat of the oven simply causes caramelisation and you have a nice brown product.

ACTION OF SUGAR

Our last question: Aside from its sweetening properties, what is the action of sugar in a cooked dish?

For a start, a small amount of sugar counteracts the effect of salt. Don't you remember the times that the lid has come off the salt shaker when you have been salting stews, soups, &c. If you didn't know the right trick, you must have had some anxious moments. Just add a sprinkling of sugar and nobody is the wiser.

The brain-teaser, flavor, about which no one seems to know very much, depends a great deal on the presence of sugar. If you doubt this, just cook some under-ripe fruit without sugar. There will be no flavor to speak of. Add sugar and the natural flavor magically appears.

It seems that, although sugar does not make an acid fruit less acid, it does counteract the effect of acid on the flavor, for the acid undoubtedly makes the flavor and the addition of sugar will bring out the flavor.

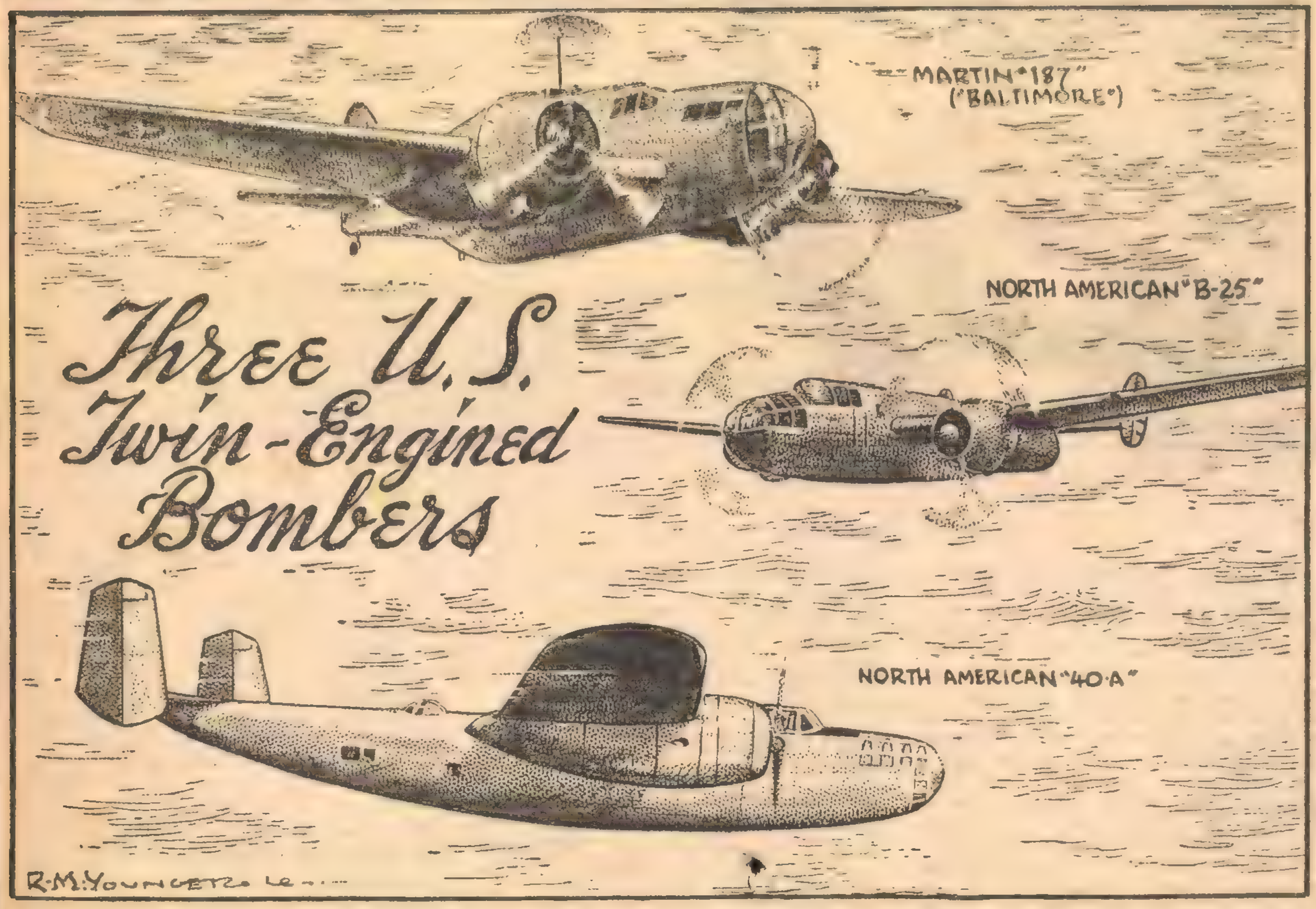
Sugar also assists in the browning of the product, as explained above.

To sum up, we see that, to combine the ingredients of a recipe in a manner which displays a certain knowledge and technique, gives the cook a great advantage over those who know nothing

(Continued on Page 53)

After all this, Calvin Walters should be able to turn out some beautiful examples of the culinary art. Ask the chef on the right. As one soon discovers, theory is not enough, one needs a lot of practical experience to go with it.

A GRIM ANSWER TO AXIS AGGRESSION



Three U.S. Twin-Engined Bombers

Since the beginning of the Pacific War, American aircraft have proved that they can hit hard. In the brilliant raid on the Philippines, conducted from Australia, in the battle of the Coral Sea, and in the bombing of Japan the world has had evidence of the power of US bombers.

THE sketch above shows three more of America's long-range, hard-hitting, twin-engined types. At the top is sketched the Martin "187" or "Baltimore," developed by the famous firm of Glenn L. Martin Company, of Baltimore, Maryland.

Many details of this interesting plane have not been released. But the facts that are known are these:

The plane is a midwing, all-metal machine, resembling closely in appearance a reconnaissance bomber built by the Glenn Martin Co. The two Wright Cyclone engines are geared, and drive three-bladed constant-speed airscrews. The engines develop about 1000 horsepower each.

The earlier model, which the Baltimore resembles, has accommodation for a crew of four, the pilot and bomb-aimer in the nose, a second pilot in the second cockpit, and a wireless operator-gunner.

There are guns in the wings, and others mounted in rotating turrets behind the wings, one above the fuselage, and one below at the point where the forward, bulky part of the fuselage sweeps upwards towards the tail.

A high speed can be expected for the Baltimore. Its prototype is capable of over 300 mph flying level, and carries a bombload of more than half a ton. A service ceiling of 30,000 feet and a range of 2500 miles made the earlier model a formidable war craft.

by R. M. Younger

It is certain that improvements are embodied in the design of the Baltimore, which was built especially for the RAF. Now it is likely to be making its way into US squadrons, too, and, in any case, it is certain that we will soon be hearing of the Baltimore in the air-war news.

The North American "B-25" medium bomber (right centre) is the type of plane which, it has been announced, took part in the raids on Tokio and other Japanese cities, and also accompanied Flying Fortresses on their long-range bombing exploit against the Japanese in the Philippines.

A midwing monoplane, the "B-25" is fast, and simply bristles with armament. It is capable of 350 mph, being powered by 1700 horsepower motors. Its range is about 1500 miles, but it can carry a bombload almost equal to that of the Flying Fortress.

Points about its design are its tricycle undercarriage—a third wheel lowers from under the nose, its widely-spaced twin rudders and powerful gun-turret in the tail.

The "40-A" (sketched at the bottom) is also built by the North American Aircraft Co. This is a high-wing design which is notable for exceptionally

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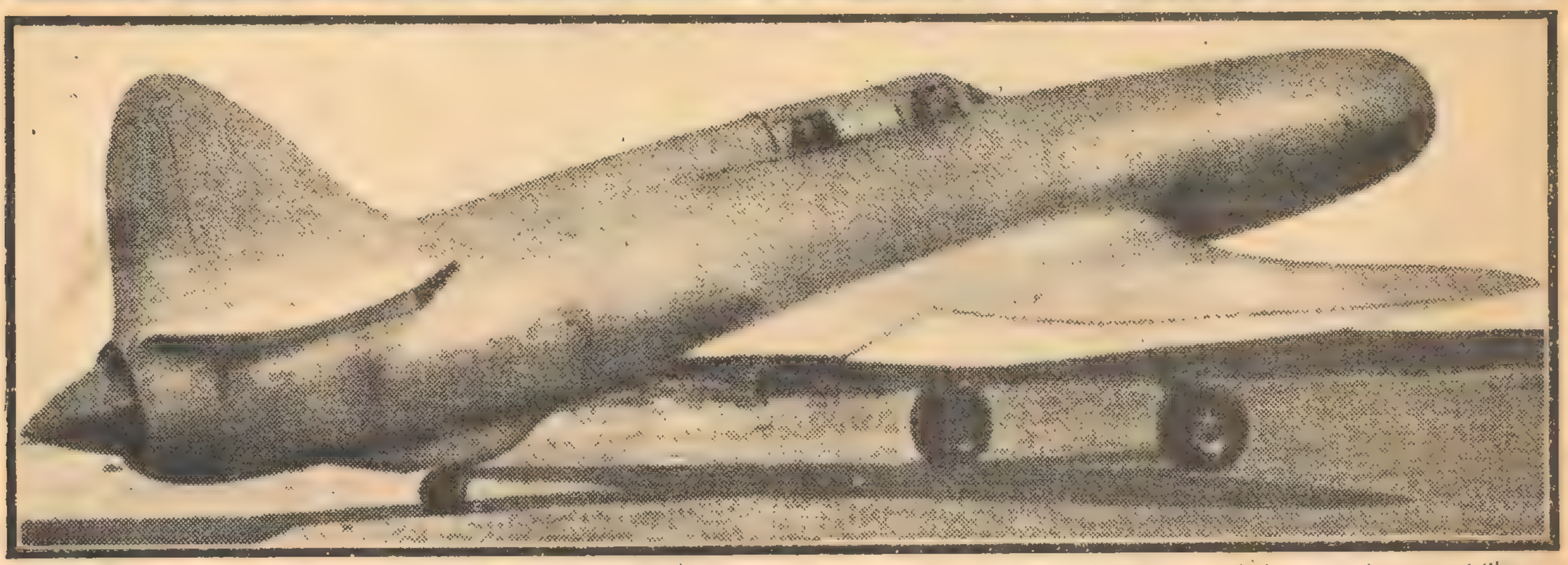
AVIATION

THE JET-PROPULSION OF AIRCRAFT



A side view of the Italian jet-propelled plane, which is reputed to have made several successful flights, including one between Milan and Rome. Note the large diameter rocket-shaped fuselage, and the regulator for the propulsive jet protruding at the rear. The general appearance of the plane conveys the impression that the designers have striven to keep clear the entire centre core of the fuselage. This may also be the reason for the peculiar bulge above the tailwheel.

It seems that we have come to look upon the propeller or air-screw as an integral and indispensable part of an aeroplane. Indeed, this has hitherto been the case. Now, however, with the continued increase in the speed and altitude of service flights, it is becoming increasingly clear to aircraft designers that some more efficient method is needed of utilising the power latent in the fuel.

FOR some time, it has been apparent that Axis aircraft designers have been studying very seriously the matter of jet-propulsion of aircraft. Apart from propaganda stories, the details of the experiments have been carefully withheld. However, from various scraps of information transmitted and smuggled from the countries concerned, it is possible to piece together some sort of a picture.

The general idea of jet-propulsion is not by any means new. From time to time inventors and would-be inventors have put forward a variety of schemes varying from flying wind-tunnels to the straight-out rocket plane. The important thing, in this case, is not so much the idea as the successful application of it to a practical aeroplane.

ALLIED EFFORTS?

While the following discussion centres mainly around the efforts of the Axis countries, it must not be assumed that Britain, America and Russia are paying no attention to the scheme. They are not likely to forfeit so easily the technical superiority which they apparently enjoy, at least in the field of aircraft design and production.

If reports are to be believed, Russia has already developed and employed certain weapons utilising the rocket principle. It is reasonable to expect that the lessons learned in these fields will be applied to aircraft.

As early as 1932, S. Campini, an engineer of the Italian Caproni Aircraft group, published an article on a jet-propelled machine for stratosphere flights at sub- or supersonic speeds. As part of the article there was included a sectional drawing of a proposed design. The drawing is reproduced herewith.

In August, 1940, a jet-propelled plane, evidently the practical outcome of Campini's ideas, made a successful flight of ten minutes' duration over the Forlanini aerodrome at Milan. Subsequently, other flights of greater duration were made, one being from Milan to Rome.

Photographs of the successful aeroplane, since made available, show clearly that it departs considerably from the earlier proposed design, which was really based on a French patent specification.

The latest plane is a low wing monoplane with two seats in tandem above the centre of the fuselage. It has a curious heavy-looking wing, with undercarriage retracting outwardly into the wings.

The earlier design suggested was for a high wing monoplane with the control cabin right out in front. The air intake was through an annular space between the rear of the cabin and the enshrouding fuselage. Photographs of the new plane show the air intake to be in the nose of the plane with the jet at the rear, beneath the tail assembly.

WIDE PUBLICITY

World-wide publicity was accorded to the public demonstration flights of this Italian jet-propelled aircraft. Italian propaganda naturally made the most of the success and the radio and the Press of many countries gave rather exaggerated prominence to the Rome-Milan flight. Nevertheless, little has been disclosed regarding the propulsive system or the construction of the craft.

Italy is very busy experimenting with future types. Signor Gaspare Santalego recently said as much in discussing development and production of aircraft in Italy, and emphasised that their practical value would become evident in the near future, if the research was maintained.

BRIEF DESCRIPTION

He then especially mentioned the Caproni-Campini jet-propelled aircraft. Briefly describing the machine, he stated that a nozzle duct runs along the entire length of the fuselage. In the forward portion of the duct an axial compressor, driven by an engine, produces a pressure increase which creates an airflow towards the aft portion of the duct.

THIS month's aviation feature, compiled by the Technical Editor, is based on an article by G. Geoffrey Smith, MBE, in the magazine, "Flight." To quote the above author, "The first successful public demonstration of an Italian jet-propelled machine should dispel any ideas that jet-propulsion is merely an armchair flight of imagination."

AXIS DESIGNERS ARE HARD AT WORK

This air stream first absorbs heat in cooling the engine, and is then joined by the engine exhaust gases, which further increase its thermal value. The expansion towards the exit is intensified by the addition of liquid fuel, which is injected and ignited in the vicinity of the dicharge nozzle.

It will be noted that the usual heat losses involved in cooling the engine and in discharging the exhaust gases to atmosphere are avoided in this system.

REARWARD THRUST

Rearward thrust is, therefore, created by the blower, on the one hand, and on the other by the expansion of the air and gases behind it. The force exerted by the stream, or jet, is the product of its mass and velocity. Fundamentally, a force acting in a given direction exerts an equal and opposite force. It is this reaction which propels the aircraft.

Santalego went on to say that this method of propulsion revealed its advantages, particularly at speeds approaching the velocity of sound. However, he gave no suggestion that such speeds had been accomplished on the machine under consideration.

The intake duct in the nose of the machine would appear to be of divergent section to build up pressure in the air stream at the expense of velocity. As a result, the velocity of the air at the blower intake would be lower than the flying speed, and thus the impeller blades can operate at a higher degree of efficiency than the airscrew blades of conventional aircraft power plants.

LOW POWER ENGINE?

From another foreign source it has been learned that the engines employed in the Caproni-Campini was of Isotta Fraschini manufacture. Merely as a hazard, it may be suggested that the unit referred to may be of the "Astro 7C40" type, a seven-cylinder, air-cooled, supercharged radial having overall dimensions of 47in. diameter and 44in. length. Normally, its rated output is 440 hp at 2000 rpm at an altitude of 4000m. (13,120ft.).

Possibly its performance has been improved, as in the jet-propelled machine it draws its air supply from the stream leaving the main blower which is at some pressure above that of the surrounding air.

The earlier Campini design also employed a radial engine to drive the compressor. In that instance, however, the engine was located before the compressor.

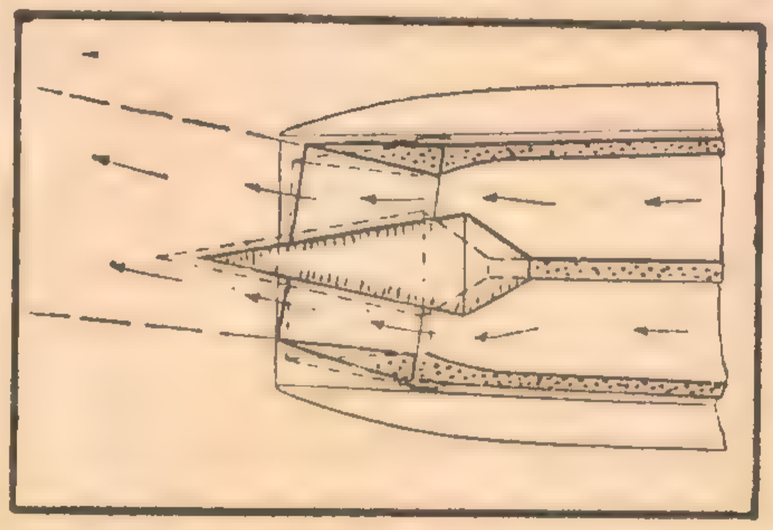


Diagram showing the method of regulating the propulsive jet and the possible arrangement for swivelling the discharge nozzle to assist manoeuvring.

One school of designers, particularly Italian and Swiss, holds the opinion that a reciprocating engine should furnish motive power for the compressor in order that advantage may be taken of a relatively high compression ratio for the more efficient combustion of the fuel, and also for the convenience of using a known and fully developed type of power unit.

There is a considerable degree of justification for this viewpoint, but the trend in other countries would seem to be towards a gas turbine located after the combustion chamber or chambers.

A Spanish aviation journal gives a review of the Campini machine which was flown from Milan to Guidonia, Rome, on Sunday, November 30, 1941. It was piloted by Col. Mario de Bernardi, the veteran Schneider Trophy ace, and a Capt. Pedace was the second occupant. On arrival at Guidonia the designer explained that high speed had not been attempted on this first public flight.

AVERAGE SPEED

Actually, 2¼ hours were taken for the journey, but this included a stop of unspecified duration at Pisa. The average speed was about 130 mph. No reason was given for the break in the journey, but the critical suggestion has been advanced that the stop was necessary for refuelling. It is rumored that the rate of fuel consumption is, at present, relatively high.

The machine is now, it is understood, being subjected to tests at the Guidonia research laboratory.

As the experimental Caproni monoplane passed over cities en route, interest was particularly aroused by the unusual character of the noise created by the machine. This would be largely explained by the absence of the usual airscrew whirr.

When the Campini machine was first flown in 1940 at the Forlanini aerodrome

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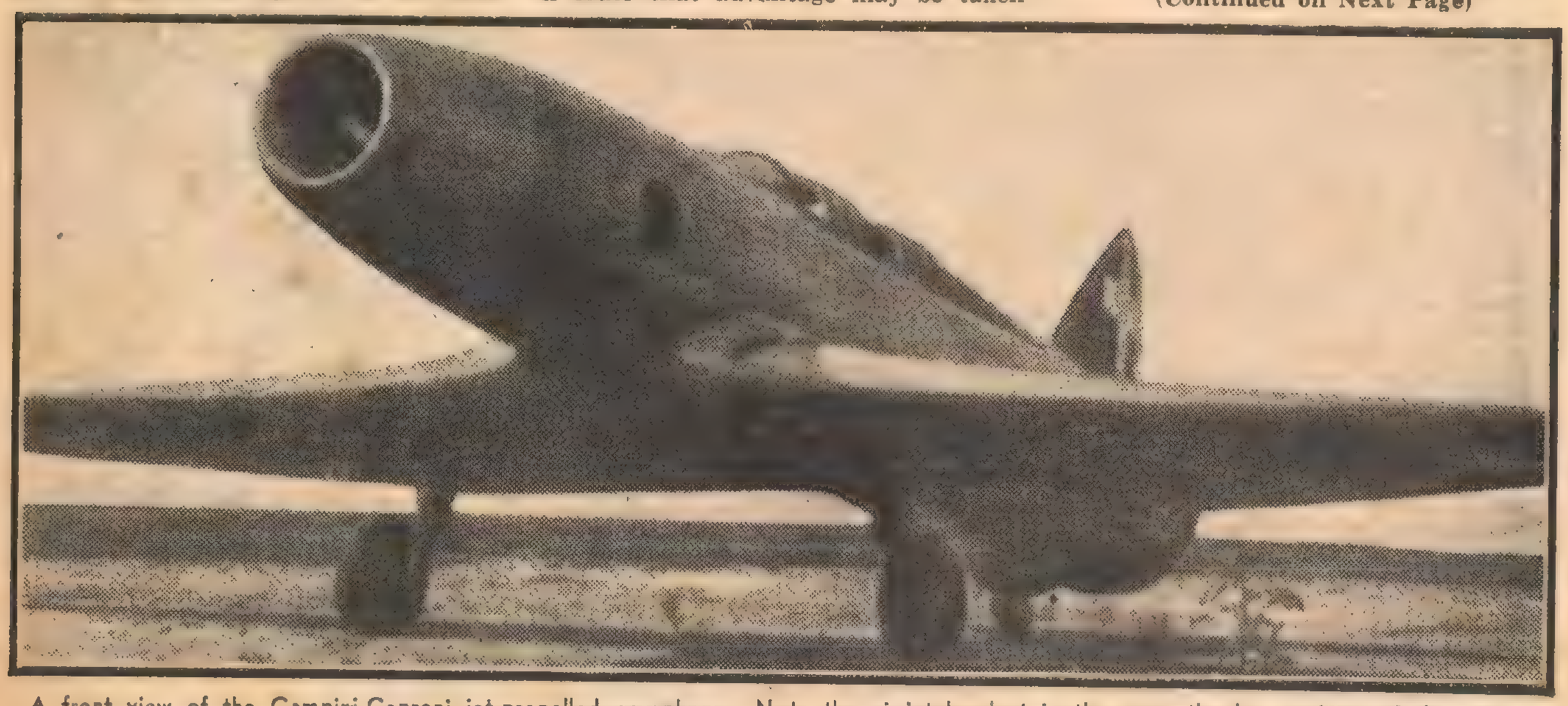
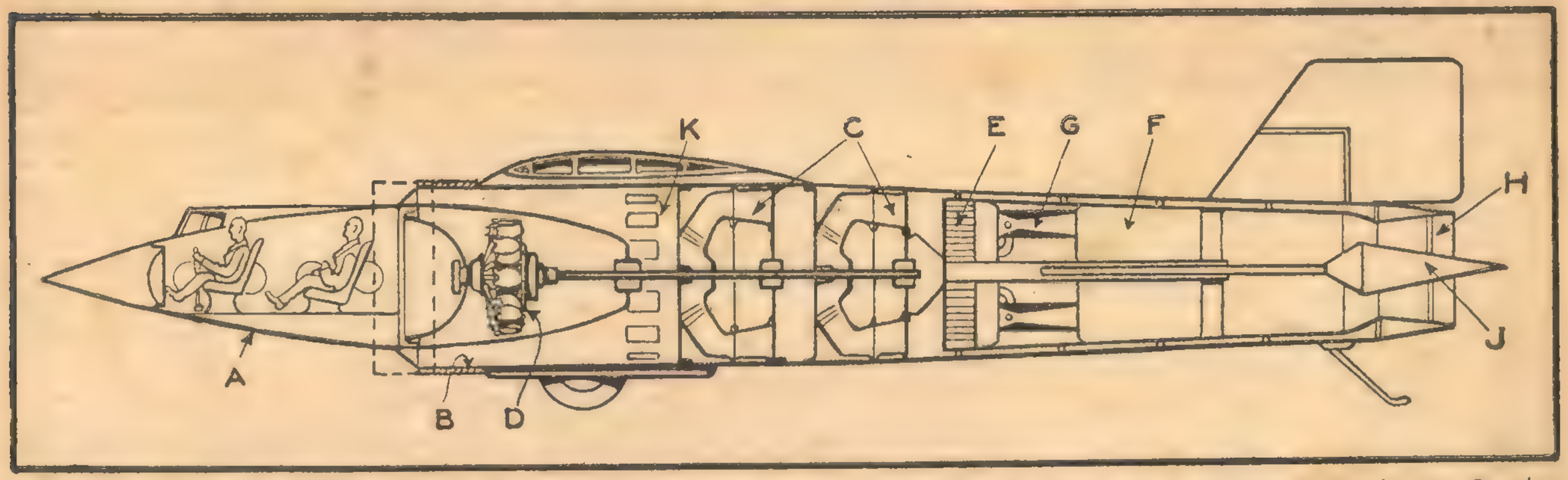


A front view of the Campini-Caproni jet-propelled aeroplane. Note the air-intake duct in the nose, the low position of the wing, and the very deep wing roots. It is suggested that the deep wing roots are necessitated both by structural considerations and in order to provide space for fuel tanks, which could not be located within the fuselage.

SKETCH SHOWING THE ORIGINAL CAMPINI DESIGN



Sectional view of the original Campini design of high-altitude aircraft for operation at either sub or super-sonic speeds. A, Ovoid cabin; B, Enshrouding cylinder; C, Two-stage centrifugal compressor; D, Radial engine; E, Rectifier radiator; F, Combustion space; G, Annular mixing channel; H, Discharge nozzle; J, Cone for varying nozzle orifice; K, Controlled lateral orifices.

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From a close examination of new views of the Caproni-Campini aircraft, it is clear that the only opening for the admission of air is a circular duct in the nose, and the only discharge nozzle is in the tail of the fuselage.

Thus, the scheme departs materially from the original layout which had a pressure cabin in the nose and admitted air via a peripheral duct at the point of maximum pressure on the fuselage.

Recent pictures of the new design would apparently confirm that Campini's original suggestion of controlling the characteristics of the jet by means of a longitudinally adjustable double-conical member mounted coaxially in the discharge nozzle, has been retained.

POSSIBILITY OF DIRECTING THE JET

The diagram shows the general principles of this device. As the conical member, under the control of the pilot, is adjusted axially, the cross-sectional area of the nozzle aperture is varied in much the same manner as a tapered needle may be employed to alter the effective area of a carburettor jet.

Although there is no specific information available on this point, it would also seem possible by means of this device to adjust the discharge nozzle to either a convergent or a divergent contour. If this is actually so, it would become possible in some degree to regulate the terminal pressure of the jet and also the terminal velocity.

The point of the conical member will be seen actually projecting beyond the discharge orifice in the side elevation of the machine.

The original design proposed the use of a universally swivelling discharge nozzle in order to impart direction to the jet, as also shown in the diagram. Externally, there is no evidence of this being employed on the latest design, which is provided with the conventional elevators and rudder.

ASSIST MANOEUVRING

However, within the not inconsiderable girth of the tail end of the fuselage it is conceivable that the swivelling mechanism is completely enclosed by the external skin.

At present-day speeds in flight, it is doubtful if facility to give directions to the jet is a feature of importance, but probably it would be of assistance in manoeuvring the machine on the ground. It must be remembered that there is no airscrew slipstream for the rudder on a jet-propelled machine of this type.

In referring to the girth of the fuselage, it would seem that the cross-sectional dimension would be at least 6ft. diameter, as the engine, which is presumed to be a radial type, is approximately 4ft. in diameter.

In general, the fuselage is of rocket shape. The structure of the fuselage and also that of the wings and tail planes, is of duralumin. Wing roots appear to be unusually generously proportioned. This may be accounted for by the need for all structural attachments to be arranged externally in order to leave the interior of the fuselage unobstructed for the main air duct.

The same reasoning may provide an explanation for the peculiar bulge below the fuselage from which the tail wheel is supported. Furthermore, this necessity to keep the interior of the fuselage clear may have been the dominant factor leading to the adoption of the unusually low position of the main wing.

It will be seen from the illustrations that the wing passes completely below the fuselage and it is possible that the centre section is utilised to house the main fuel tanks.

NEW GERMAN SCHEME

In the meantime, some details are filtering through of a German scheme of jet propulsion, sponsored by none other than the firm of Ernst Heinkel. The designer, Herr Max Hahn, of Seestadt Rostock, has evolved what appears to be a simple and compact unit embodying a turbine and compressor in combination. The main feature of the design will be appreciated from the diagram.

In a circular casing having an axial air intake at the front and coaxial discharge orifice at the rear, a shaft is mounted in two bearings supported on spiders.

On this shaft is a single rotor which is divided to form a box-type blower impeller A and a boxed turbine wheel B. Air drawn into the unit through the forward central aperture leaves the impeller at its periphery and the stream is here divided by a projecting guide C

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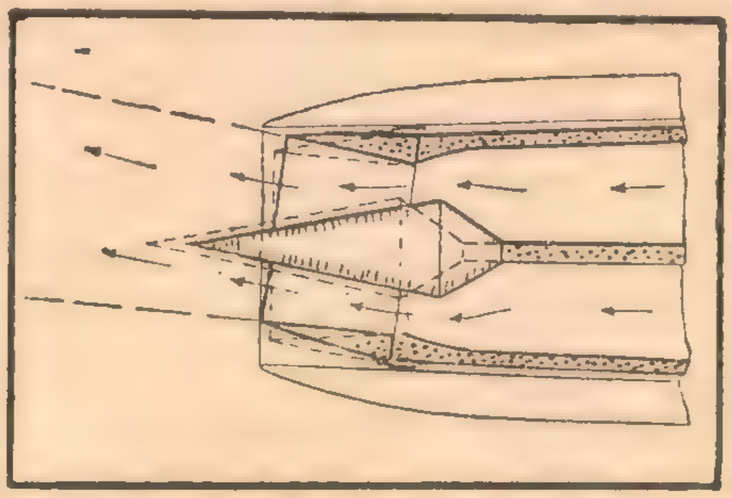

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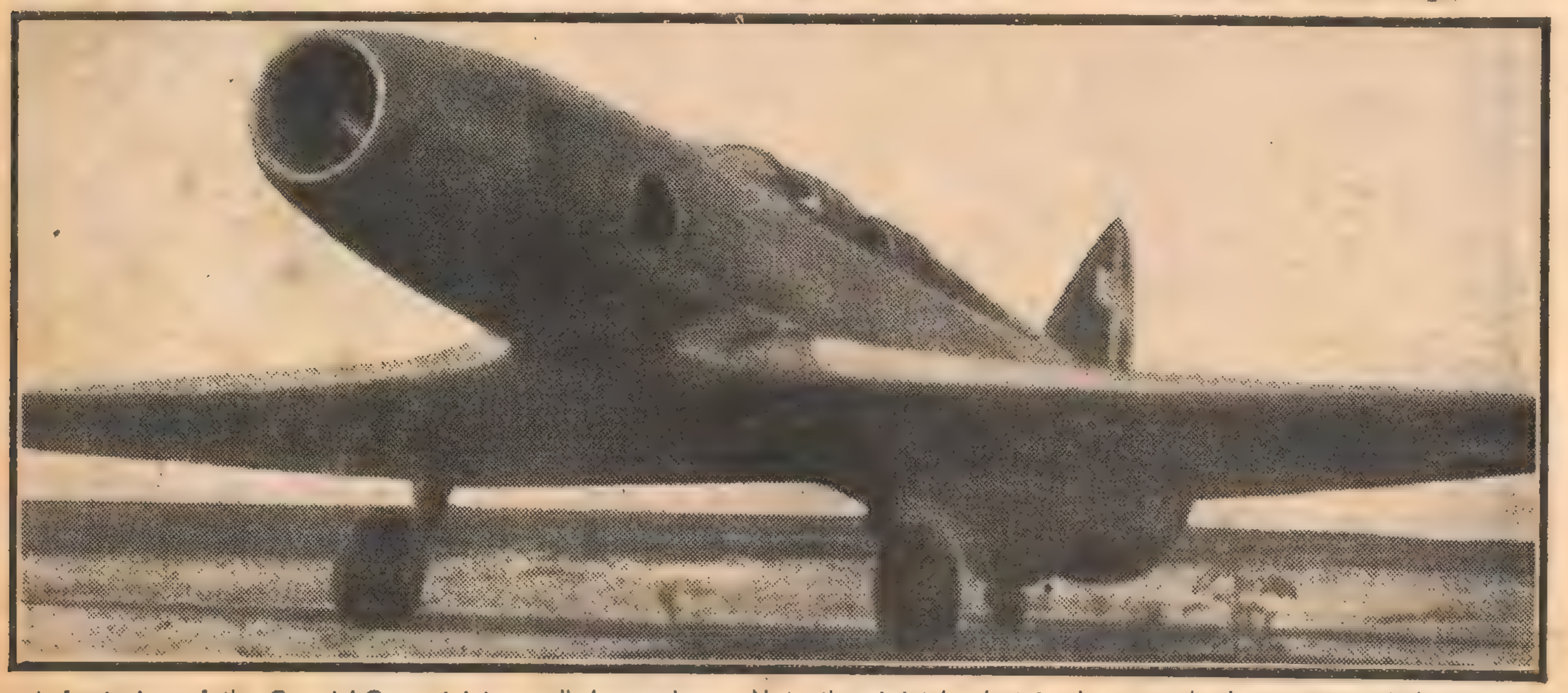

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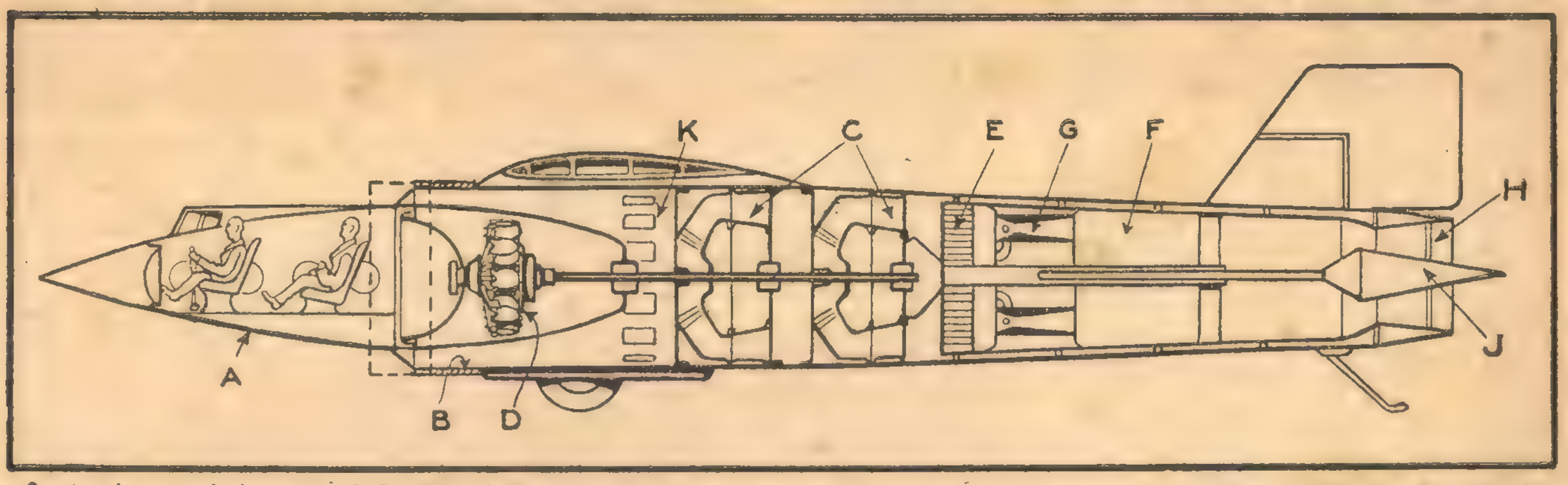

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In referring to the girth of the fuselage, it would seem that the cross-sectional dimension would be at least 6ft. diameter, as the engine, which is presumed to be a radial type, is approximately 4ft. in diameter.

In general, the fuselage is of rocket shape. The structure of the fuselage and also that of the wings and tail planes, is of duralumin. Wing roots appear to be unusually generously proportioned. This may be accounted for by the need for all structural attachments to be arranged externally in order to leave the interior of the fuselage unobstructed for the main air duct.

The same reasoning may provide an explanation for the peculiar bulge below the fuselage from which the tail wheel is supported. Furthermore, this necessity to keep the interior of the fuselage clear may have been the dominant factor leading to the adoption of the unusually low position of the main wing.

It will be seen from the illustrations that the wing passes completely below the fuselage and it is possible that the centre section is utilised to house the main fuel tanks.

NEW GERMAN SCHEME

In the meantime, some details are filtering through of a German scheme of jet propulsion, sponsored by none other than the firm of Ernst Heinkel. The designer, Herr Max Hahn, of Seestadt Rostock, has evolved what appears to be a simple and compact unit embodying a turbine and compressor in combination. The main feature of the design will be appreciated from the diagram.

In a circular casing having an axial air intake at the front and coaxial discharge orifice at the rear, a shaft is mounted in two bearings supported on spiders.

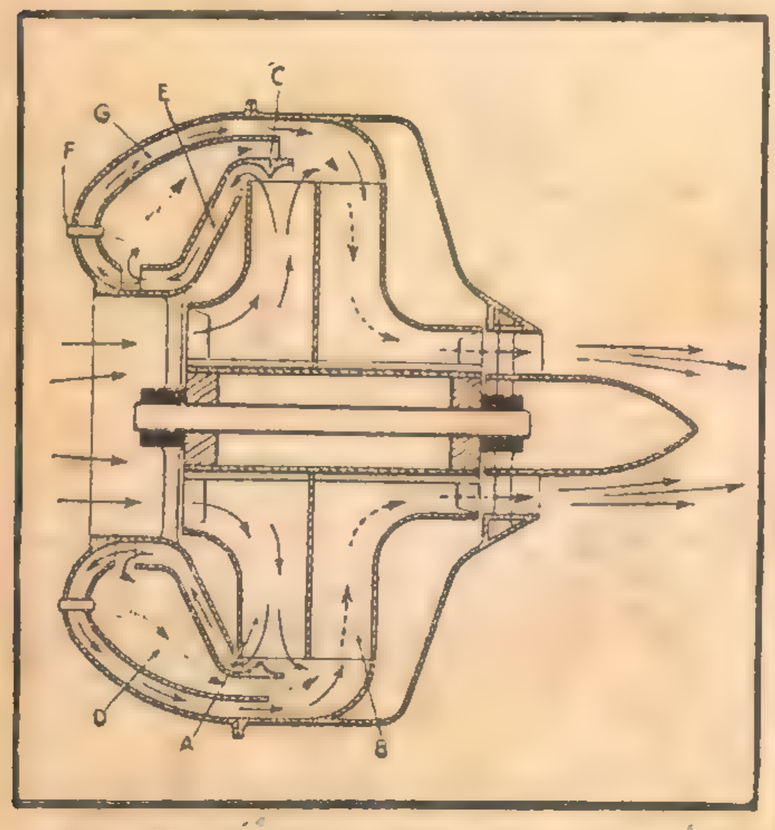
On this shaft is a single rotor which is divided to form a box-type blower impeller A and a boxed turbine wheel B. Air drawn into the unit through the forward central aperture leaves the impeller at its periphery and the stream is here divided by a projecting guide C

on the enshrouding wall of the annular combustion chamber D.

The main supply is diverted to the rear of the turbine wheel, whilst a smaller portion passes along passage E between the main casing and the combustion wall.

At the point of smallest diameter, surrounding the intake aperture, this portion of the airstream is again divided. Part enters chamber D into which fuel is injected by nozzles F and burnt to furnish additional heat for the final jet.

The remainder continues around the combustion chamber in space G and joins the initial airstream and the effluent from the combustion chamber to form a common stream, which ex-



A self-contained, all-rotary jet-propulsion unit recently patented by the German firm of Ernst Heinkel. The key to the diagram is given in the accompanying paragraphs.

pands through the turbine and furnishes the motive power for rotating the blower.

The annular discharge from the turbine wheel is a high velocity, rearwardly directed jet, the reaction of which furnishes the propulsive effort.

By passing a portion of the airstream completely round the combustion chamber this is effectively insulated and heat from the chamber is not completely lost by radiation to the atmosphere, but is largely carried off by the air to perform useful work in expansion through the turbine.

OBVIATES THE ENGINE

This design is extremely interesting in that it virtually abolishes the engine in the usual sense of the word. If successful, planes using this type of propulsion would be extremely reliable in their operation, quite apart from the question of efficiency.

However, jet-propelled planes are manifestly still in the experimental stage, and, unless the war lasts for a longer period than we desire or anticipate, they will make their debut in the service of commerce rather than of destruction.

Even assuming that aircraft designers were to evolve a high-performance prototype, using this new principle, it would take quite a long time to produce service aircraft in numbers sufficient to displace the now vast fleets of more conventional fighting planes.

THE NEW DAVIS WING

(Continued from Page 6)

mathematical drag factor in somewhat the same way that a bump on a wheelbarrow wheel would not be noticed until the wheel was rolled.

There being no solid path in the air, and with a wing a fixed object, anyway, the only way to develop Davis' theory was by mathematics, with the circle as a starting-point.

From now on, Davis was up in the rarefied atmosphere of pure science, with only trigonometry as his support. It would take a book to explain the trigonometric juggling that finally emerged as a formula. It has not yet been satisfactorily translated into calculus equations.

NEW EQUATIONS

Davis now had a mathematical equation of Einsteinean complications, that would outline airfoil shapes for whatever performance characteristics were desired, whether high speed, high lift, or the most efficient compromise. Next he applied for a patent, which was granted at the end of three years, an unprecedented recognition of a pure mathematical equation—patentable because the objects described and predicted by the formula were a family of related shapes, having a definite utility and function.

Wind-tunnel experiments were too costly for Davis, so he mounted a three-foot segment of wing, devised his own wind pressure instruments, and worked out a platform that could be mounted on the top of a car for air-flow testing. But he had no car. Douglas Shearer, whose name we have often seen in Metro-Goldwyn-Mayer films as M-G-M sound engineer, supplied the car, and also financial help.

EARLY TESTS

Testing clearly proved the superior efficiency of his formula-derived airfoil. But his next step, to interest a factory, was a hopeless struggle, until Consolidated Aircraft decided to gamble a million dollars, and the climax occurred when the 52-passenger Consolidated flying boat took off from San Diego Harbor in May, 1939.

The huge hull, 23ft. deep, lifted off the water after as short a run as that of a land plane. The test pilot was delighted with the performance, and described the huge plane as a flier for manoeuvrability.

The aerodynamists then reluctantly admitted that the Davis formula might have something to it, and admitted that standard airfoils might possibly be improved slightly. They later claimed to have something just as good in the way of wings.

One is called the "laminar-flow" wing, and is a secret as far as its practical use is concerned.

Laminar-flow advocates admit the wing does not test too well in a wind tunnel, except under special conditions, thus avoiding a comparative test with the Davis wing. Another post-Davis development is a theoretical super-sonic wing, claimed to be even better than the Davis wing, when the speed of sound—about 750 mph—is reached.

The second practical demonstration that the Davis wing is best came when the Consolidated B124 Army bomber was tested several months later. Real figures are a secret, but it has been estimated that the wing would permit speeds of 330 to 360 mph.

INCREASED EFFICIENCY

Most planes will carry a useful load equal to their weight when empty—a bomber weighing 20,000 pounds when empty would thus carry 20,000 pounds weight in crew, gasoline, and bombs, for a total weight of 40,000 pounds.

A 20 per cent. increase in efficiency would allow the bomber to carry an additional 8000 pounds, a useful-load increase of 40 per cent. The most convincing proof is that the B-24 has been selected as the Army standard for mass production of bombers.

To answer the critics' comments that the Davis wing was useful only for heavy loads, Davis has designed a flyer built round the 1100-hp Allison engine. Wind tunnel tests show a top speed of 430 mph, landing speed 60 mph, service ceiling 40,000 feet. Extra gas tanks could easily be installed in the wings for increased cruising range.

NIGHT PATROLS

What might be a partial answer to night bombing is that a service ceiling of 40,000 feet, and a large gas capacity, will allow a number of such planes to maintain high altitude patrols over bomber altitudes for hours at a time. When informed of approaching bombers, they could intercept them from above, not to attack necessarily, but to drop flares that would light the bombers, making them targets for attacking planes.

It is not difficult to visualise the situations when the advantages given to Allied planes by the Davis wing might mean the difference between life and death for our airmen—and the difference between victory and defeat for ourselves.

A GRIM ANSWER TO AXIS AGGRESSION

(Continued from Page 11)

The cigar-shaped fuselage is perfectly streamlined.

Mounted amidships on top of the fuselage is a stinging gunpost. Speed of the "40-A" is believed to be less than that of the "B-25," but still great enough to make it a valuable bombing craft.

Possibly, the inclusion of new, more powerful engines would bring this machine into the front-rank of the world's war plane for offensive action.

ITEMS OF NEWS FROM A WORLD AT WAR

US "Aerodynamic Honey"

AN "aerodynamic honey" is the description given the US Marauder bomber now being used to hammer Jap bases north of Australia.

Its official American designation is B26.

Clean, deadly, and sleek, it is one of the world's fastest bombers, and can outpace most Japanese fighters.

A US pilot tells this story of the use of Marauders in a raid on Japanese island bases:

"We had dropped our load of eggs and were coming home.

"Some Zeros took off after us. We turned on the juice and were leaving them behind.

"Our rear bombardier, greatly disappointed, shouted: 'Damn it all, can't you slow down a bit and give me a poke at them?'"

* * *

New Zeros In Use

THE Japanese recently used a new and faster type of Zero fighter in a daylight attack on Port Moresby.

Fifteen of these new fighters engaged our planes in some of the fiercest dogfights seen over Port Moresby.

The new Zeros surprised our men by their terrific bursts of speed, and by staying longer in action.

But our fighters were more than a match for the raiders.

Europe Facing Great Famine

EUROPE is threatened with one of the worst famines in history, states the US Agriculture Department.

Reports received by the department say that Europe's food supplies have been brought to an unprecedently low level by the worst winter in memory and drought conditions.

"There is a possibility of Europe being reduced to conditions of Continent-wide hunger," the department states.

BRITAIN'S NEW AIR ARMY

Britain has a new Army of the Air which is an integral part of the regular Army.

This new formation, states a news agency war correspondent, is equipped with its own gliders and RAF squadrons of Army Co-operation Command.

Paratroops, glider pilots, and men trained to go into instant action from aircraft make up its personnel.

Three distinctive badges mark these new picked warriors of the air—a plum-colored beret, a shoulder flash with the word "Airborne," and a blue and white badge showing Bellerophon—the destroyer of monsters—mounting Pegasus, the winged horse.

Salvage Of Normandie

PRELIMINARY work has begun on raising the capsized liner Lafayette (83,400 tons, formerly the Normandie) from the bed of New York Harbor, where she has rested since a disastrous fire on February 9.

Work began following a special committee's report.

Salvage will take a year, and then the liner must be refitted before she can go into service.

A Navy spokesman said the method of salvage would be to divide the underwater portions of the ship by bulkheads and pump out the water until the vessel was righted. The enormous task was greatly complicated by the Lafayette resting at one point on a rock ledge.

* * *

Vast New Air Plant In US

CONSTRUCTION of the world's mightiest warplane factory is planned in America, with an output which, officials say, "will stagger the imagination."

It will dwarf Henry Ford's huge Willowrun bomber factory, which at present is the world's largest.

The size and location of the plant are naturally military secrets, but officials declare that eventual production will eclipse the combined output of several big factories, at present making bombers.

* * *

Bombs Quieten Volcano

BOMBS from US Army planes have finally quietened a huge lava flow from the Mauna Loa volcano, Hawaii, which treatened the city of Hilo.

The volcano exploded violently on April 26, and continued in eruption for a fortnight.

At the height of the flow, molten lava reached within eight miles of Hilo, causing some property damage.

It was Mauna Loa's greatest activity since 1881.

Mauna Loa (13,675ft.), an immense lava dome, is not only the largest volcano but the largest mountain in the world in cubic content.

In 1859 lava flowed for 33 miles. The flow was a mile wide in places.

* * *

New German Air "Mine"

THE Germans are using a new anti-aircraft shell which contains about 200 yards of steel rope, with a parachute at one end and a miniature mine at the other.

A Swiss newspaperman, reporting this from Berlin, says the mine's ignition is timed so that it becomes harmless by the time it reaches the ground.

The Germans claim that a curtain of the shells was effective against an RAF attack on an important factory.

FOR EVERY MAN IN THE FRONT LINE —

This is a war of machines. For every man in the front line many others toil at their benches to produce for him the weapons with which he must defend and destroy. All over the world young men and young women are learning to operate the intricate machines which collectively make up a modern factory.

Latest Fighters

THE Typhoon fighter is Britain's answer to improved German fighter planes.

Designed by Mr. Sydney Camm, who designed the Hurricane, the Typhoon develops 2400 hp on the ground. This far outstrips the power of the Spitfire or of Germany's latest fighter, the Focke-Wulfe 190.

The new Focke-Wulfes are the most formidable challenge to British machines the German air force has launched in the west.

The Typhoon's air speed exceeds 400 mph. The Focke-Wulfe's maximum is 370 mph.

The new Focke-Wulfes have a 1600 hp engine, compared with the Spitfire's 1300 hp engine.

The German plane is said to be able to outclimb the Spitfire, and its armament, although still experimental, is formidable.

Instead of a slick, streamlined cylinders-in-line engine, the designer, Kurt Tank, put an air-cooled radial engine into the new machines, which resemble closely the "tubby" pattern of American fighters.

Only by this sacrifice of streamline was he able to secure the great engine capacity needed to challenge the Spitfire.

* * *

New Nazi Planes

ACCORDING to the journal "Aeroplane," the following new types of German aircraft have been introduced recently:—

BV222, a multi-seat transport and patrol flying-boat, with six 1000-hp engines, and a maximum speed of 199 mph. It was designed before the war for the proposed transatlantic service, and is unlikely to be built in large numbers.

BV141, of the flying wing type, with an observation turret on one wing and steering planes on the other.

Henschel HS129, a single-seat close support fighter-bomber, with two 450-hp engines, probably two cannon and four machine-guns. It has a maximum speed of 225 mph, and is probably heavily armored. It may now be on issue to service squadrons.

Messerschmitt 210, a two-seater fighter-bomber, with two 1450-hp engines, probably two cannon and four machine-guns, and a maximum speed of 285 mph. It was developed from the Messerschmitt 110, but has greater capacity, and is probably able to carry 4000lb. of bombs.

DGS230, a 10-seat troop-carrying glider, first used in Crete.

Gotha GO242, a 23-seat troop glider capable of carrying two tons of freight It is being used in Libya, and is usually towed by a Junkers 52 transport plane

* * *

Stainless Steel Planes

IT is reported in the "Iron Age" that a big fleet of stainless steel cargo planes are to be built for sale to South America They will be the first all-stainless steel type to enter mass production anywhere in the world.

WE WILL BOMB GERMANY, CITY BY CITY

The grim warnings of Britain's wartime leaders took concrete form recently, when great armadas of British bombers filled the sky over Essen and Cologne. Great Stirling bombers, with Halifaxes, Manchesters, Lancasters, and a variety of smaller craft, rained down death and destruction, laying waste great tracts of Germany's key industrial cities.

Ford Bombers One An Hour Planned

THE first Ford bomber rolled off the half-mile assembly line of the vast Willowrun plant at Detroit on May 21

The new plane, technically described as B24E, weighs 30 ton and is powered by four Pratt-Whitney 1250 hp motors It has a cruising range of 3000 miles. a speed of 300 mph, and carries four tons of bombs.

A Ford official revealed that the new factory expects to reach production of a bomber every hour, with workers doing three eight-hour shifts.

An example of the factory's amazi efficiency is the huge milling machine performing 11 operations simultaneously and reducing the time to construct the centre-wing structure from several days to a fraction of an hour.

* * *

Measuring Soil Moisture

MOISTURE in the soil is measured by means of a new device which consists of a block of gypsum in which a pair of electrodes is embedded. It is set in the soil in such a way that soil moisture passes into the gypsum.

The resistance to the passage of an electric current becomes lower in accordance with the amount of moisture the soil is able to deliver to the block It is thus possible to calculate the amount of water available for plant.

Technical Section For Beginners

Foreword

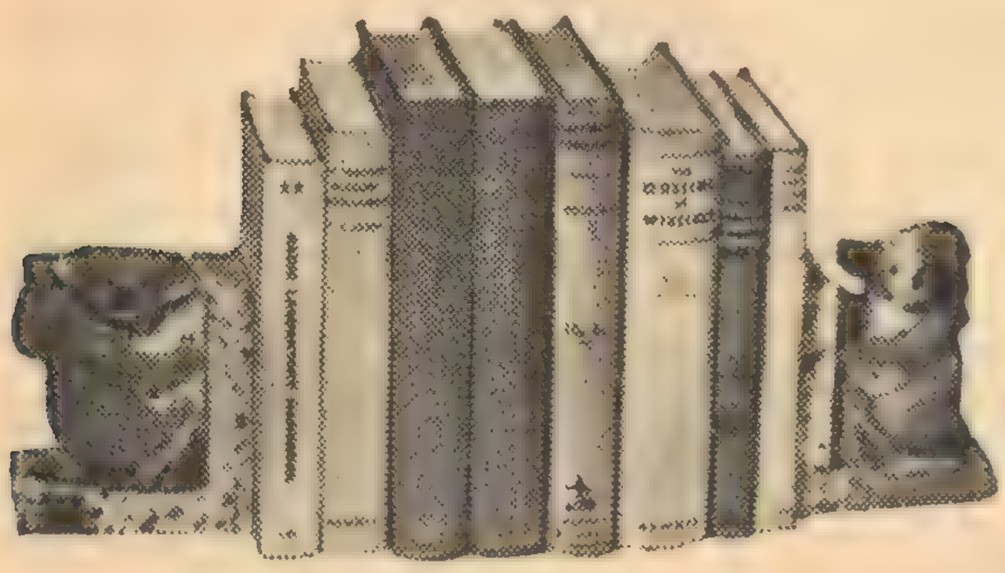
AS long as radio exists as a hobby there will be a demand for articles describing in detail the construction of small receivers. Every month, every week, new faces join the ranks of radio enthusiasts.

In July, August, and September last year, you may remember, we described a series of small receivers. This time we have sought to include a number of circuits along the same lines within the covers of a single issue. Lack of space has rather cramped our style, but it is of no use complaining.

If you have access to those earlier issues, read through the three articles and, perhaps, they will clear up a point or two, which we have not been able to cover fully here.

The list of radio text-books should prove useful not only to beginners but to more advanced enthusiasts who wish to increase their knowledge of radio theory.

The short article on Reading Circuit Diagrams is given in response to many requests and we trust that it will help some along the path to a better understanding of our grand hobby and occupation.



Radio Text-Books

We get quite a lot of letters from young chaps in their 'teens —and from older folk as well—who, to use the old saying have been badly bitten by the radio bug. Having built up a few crystal sets and, perhaps, one or two small valve sets, they are anxious to take up the study of radio more seriously. One of the stock questions they ask is: What book can you recommend me to buy?

USUALLY, we refer them to one of our advertisers dealing in radio text books. Those in charge of a technical book section are really in a better position to deal with such inquiries than we are. They know all the answers in regard to availability and price and know, from experience, the reception accorded to the individual books on their shelves.

However, with the idea of including in this issue a section dealing with text-books, we went around and had a look at those available.

It is indeed remarkable to note just how many different books, periodicals, pamphlets and leaflets have been printed in the short history of radio. If they were all listed together, Heaven only knows how long the list would be.

Pamphlets and leaflets are rather like wars. They are with us for a while and then they pass on into the dim pages of history. Technical and semi-technical periodicals, published in Australia, you probably know about already. The many technical periodicals published overseas are rather irregular and very scarce, particularly those from non-sterling countries.

As far as text-books are concerned, the shelves still appear to be reasonably well stocked. Of course, there are gaps which may not be filled for a long time to come. Others are in short supply. You may be fortunate enough to get the book you want immediately, or you may have to wait for it to come to hand.

Those of you who have been used to buying novels for a few shillings are in for an unpleasant surprise when you come to buy text-books, for the prices seem rather high by comparison. This is particularly true at present, the prices of many books having increased by 50 per cent. over those reigning at the outbreak of war.

The prices given in the accompanying list are the approximate prices as at June 1. They are given merely as a guide and do not represent prices at which particular books must be sold.

A word in season: There is no one text-book which will magically transform a pastrycook into a radio engineer. Each book is written to fulfill a particular purpose.

A book such as Ralph Stranger's "Outline of Wireless" will give a good general knowledge of radio theory. A regular study of periodicals such as "Radio and Hobbies," with practical experimenting, will provide the necessary link between theory and practice.

The student may then proceed to brush up his maths and pass on to the study of the more advanced radio engineering text-books. Still later can come a study of advanced mathematics and the study of specialised branches of the science.

THE OUTLINE OF WIRELESS
By RALPH STRANGER

THIS book is written in a characteristically chatty style, the author illustrating the various points of the discussion in rather novel fashion and not infrequently breaking in with a humorous story. The book is easy to read and technically accurate.

Approximately the first 100 pages are devoted to a discussion on the constitution of matter, energy, electron movement, conductors, &c. The next 100 pages or so cover EMF, current flow, resistance, magnetism and electric machines.

Other sections deal with the propagation of wireless waves, reading circuits, mathematics, graphs and formulae, batteries, typical circuits, valves, and finally measuring instruments.

Altogether, it is an excellent book for private study, and will give a good grounding in fundamental theory. The present price is approximately 19s.

★ ★ ★

AN ELEMENTARY WIRELESS COURSE FOR BEGINNERS
By J. H. Reyner

THIS book comprises 279 pages in all and sells for about 6s. The writer pictures an ordinary radio receiver and then proceeds to answer a series of questions as to the purpose and function of the various components.

It covers quite a lot of ground, and would be a very useful book to anyone who already has a slight smattering of radio knowledge.

SYSTEMATIC STUDY

Of course, there are plenty of readers who have no desire to go this far. Indeed, that is not necessary for the pursuance of radio as a hobby. However, such systematic and progressive study is certainly necessary for anyone who aspires to occupy a really good position in the technical side of radio.

However, when buying text-books, don't try to take short-cuts to knowledge. It is quite futile trying to study advanced radio engineering text-books without a sound knowledge of the basic theory. Finally, don't be afraid to take out the old school algebra and trigonometry books. You will find that the almost forgotten sines, cosines, logarithms, equations, &c., weave themselves into your study of radio theory.

Without further ado, we present a list of the radio text-books which you have a reasonably good chance of obtaining in Australia. Half a dozen of those most interesting to beginners in radio are reviewed in greater detail.

COMPLETE LIST

"Elements of Acoustical Engineering," by Harry F. Olson, E.E., Ph.D. 344 pages, diagrams. 48s.

"Audels' New Radioman's Guide," by E. P. Anderson. 755 pages, hundreds of diagrams. 24s.

"Fundamentals of Radio," by Frederick Emmons Terman, Professor of Electrical Engineering, Stanford University, author of "Radio Engineering," &c. 458 pages, illustrated. 24s 6d.

"Radio Trouble-Shooter's Handbook," by Alfred A. Ghirardi, B.S., E.E. 710 pages, 11in. x 8½in., 134 illustrations. 28s.

"Practical Radio Advertising," by Herman S. Hettinger, Ph.D. 373 pages. 32s 6d.

"The Oscillator At Work," by John F. Rider. 243 pages, diagrams. 12s.

"Signalling." An Elementary Reference Manual, Covering Morse Code and its Application to Aural and Visual Signalling, Operating, Procedure, and Fundamental Electrical Principles. 64 pages. 2s.

"Signal Training." For use by Army Signallers, &c. 96 pages, illustrations and diagrams. 2s 6d.

"Cathode-Ray Oscillographs," by J. H. Reyner, B.Sc., A.C.G.I., D.I.C., A.M.I.E.E., M.Inst.R.E. 177 pages, 128 illustrations. 13s 9d.

"The Practical Wireless Encyclopedia," by F. J. Camm. Eighth edition, revised. 394 pages, over 500 illustrations. 13s 6d.

"Newnes Short-Wave Manual." A treatise on the design, construction, operation and adjustment of short and ultra-short wave receivers, aerials, and equipment. Edited by F. J. Camm. 214 pages, 118 illustrations. 7s 6d.

"Principles and Practice of Radio Servicing." by H. J. Hicks, M.S. 305 pages, 211 diagrams. 24s.

"Radio Service Trade Kinks," by Lewis S. Simon. 269 pages, illustrated. 12s 6d.

"Modern Radio Servicing." by Alfred A. Ghirardi, E.E. 1300 pages, hundreds of illustrations. 37s 6d.

"A First Course In Wireless," by "Decibel." 229 pages, 93 illustrations. 8s 3d.

"Handbook of Technical Instruction." For wireless telegraphists. By H. M. Dowsett, M.I.E.E., F.Inst., P.M.Inst., R.E. Sixth edition, 1939. 624 pages, 578 diagrams. 40s.

"Admiralty Handbook of Wireless Telegraphy." 1938. Volume I. Magnetism and electricity. Volume II. Wireless telegraphy theory. 2 volumes. 18s 9d. Sold separately, Volume I. 7s 6d, Volume II., 11s 3d.

"Wireless Direction Finding," by R. Keen, B.Eng., with a foreword by T. L. Eckersley, F.R.S. Third edition, 1938. 803 pages, 549 illustrations. 47s.

"Radio Laboratory Handbook," by M. G. Scroggie, B.S.C., A.M.I.E.E. 384 pages, 211 diagrams. 20s.

"Electrical and Radio Notes for Wireless Operators." Air Ministry Publication, A.P. 1762. 246 pages, hundreds of diagrams. 6s 3d.

"Understanding Radio." A guide to practical operation and theory. By Herbert M. Watson, Herbert E. Welch, and George S. Eby. 601 pages, 406 illustrations. 22s 6d.

"Radio Operating, Questions and Answers," by Arthur R. Nilson and J. L. Hornung. Seventh edition, 415 pages. 20s.

"The Morse Code." Learning and practice. By R. G. Shackel, M.A. 64 pages. 1s 6d.

"Thermionic Vacuum Tubes," by E. V. Appleton, M.A., F.R.S. Third edition. 5s 9d.

"Elementary Handbook for Wireless Operators," by W. E. Crook, A.M.I.E.E., A.F.R.Ae.S. 102 pages, 138 diagrams. 1941. 6s 6d.

A FIRST COURSE IN WIRELESS

By "DECIBEL"

COMPRISING 225 pages in all, this book is written in a fashion rather reminiscent of the school text-book. Without embellishments, it proceeds in ordered chapters to cover the fundamentals of electricity, wave propagation, modulation, receivers and high and low frequency amplifiers.

There are, in addition, special chapters on such subjects as reading circuit diagrams, superheterodyne receivers, mains-operated receivers, tone control, AVC, &c. Provided it is read carefully and with concentration, the book should be most useful to beginners. The price is approximately 8s 3d.

★ ★ ★

FOUNDATIONS OF WIRELESS

By A. L. M. SOWERBY, M.Sc.

THE third edition of this well-known handbook has been completely revised by M. G. Scroggie, B.Sc., AMIEE, of the "Wireless World." This excellent book covers the scope of radio theory from fundamental principles to fairly advanced design considerations.

No great amount of space is devoted to repetition or analogy, and wide use is made of expressions and graphs used in more advanced engineering text-books. Consequently, it is not a book which can be read through quickly, but requires to be studied methodically and carefully.

It comprises 327 pages in all, and sells for approximately 10s.

★ ★ ★

EVERYMAN'S WIRELESS BOOK

By F. J. CAMM

THIS particular book is not intended to provide a course of study in radio. Although a certain amount of fundamental theory is given at the beginning, its purpose is to enlighten as regards the broad principles of radio reception, rather than to go into great technical detail.

For the most part, the book deals with the practical problems encountered by those who take up radio as a hobby. One general impression is that it should be a very useful companion volume to one of the other books mentioned elsewhere devoted to a study of radio theory.

"Everyman's Wireless Book" comprises 288 pages in all and sells for 7s 9d.

★ ★ ★

THE PRACTICAL WIRELESS ENCYCLOPAEDIA

By F. J. CAMM

AS the name implies, this book is purely and simply an encyclopaedia of wireless terms. The subjects covered are numerous indeed, the various items being arranged in alphabetical order. The book is profusely illustrated and is certainly a fount of information for the wireless enthusiast. It contains just on 400 pages and sells for approximately 13s 3d.

"Audel's New Electric Science Dictionary," by Frank Duncan Graham. 525 pages. 12s.

"Electrical Communication," by A. L. Albert. Second edition, 534 pages, 398 illustrations. 47s.

"Electrons," by Jacob Millman, Ph.D., and Samuel Seely, Ph.D. 721 pages, diagrams. 1941. 40s.

"Theory of Gaseous Conductions and Electronics," by Frederick A. Maxfield, Ph.D., and R. R. Benedict, M.S. 483 pages, diagrams. 1941. 36s.

"Acoustics," by Alexander Wood, M.A., D.Sc. 588 pages. 1940. 52s.

"Introducing Radio Receiver Servicing," by E. M. Squire. 100 pages, 106 diagrams. 10s.

"Vacuum Tube Voltmeters," by John F. Rider. 179 pages, diagrams. 1941. 16s.

"The Meter At Work," by John F. Rider. 152 pages, 138 diagrams. 1941. 12s.

"Principles of Electron Tubes," by Herbert J. Reich, Ph.D. First Edition, 398 pages, diagrams. 1941. 28s.

"R.C.A. Receiving Tube Manual." 239 pages, diagrams. Technical series RC14. 2s 6d.

"Experimental Radio Engineering," by E. T. A. Rapson, M.Sc. Assisted by E. G. Ackerman. 142 pages, 169 diagrams. 1940. 13s 9d.

"How To Make Good Recordings." 128 pages, illustrated. 1940. 12s 6d.

"The Behavior of Slow Electrons In Gases," by R. H. Healey, D.Sc., F.Inst., P.Amalgamated Wireless Valve Company, and J. W. Reed. 179 pages, diagrams. 1941. 20s.

"The Physical Principles of Wireless," by J. A. Ratcliffe, M.A. Fourth edition, revised and enlarged. 6s 9d.

"Radio Training Manual." Edited by F. J. Camm. 159 pages, 96 illustrations. 7s 6d.

"Radio Engineer's Pocket Book," by F. J. Camm. 147 pages. 4s 6d.

"An Introduction To Frequency Modulation," by John F. Rider. 136 pages, diagrams. 12s.

"The Amateur Radio Handbook." Second edition. 323 pages, diagrams. Published by the Incorporated Society of Radio Engineers, Great Britain. 9s 6d.

"The Superhet Manual." Edited by F. J. Camm. 135 pages, fully illustrated. 7s 6d.

"1940-1941 Amplifier Handbook and Public Address Guide," by Moe Asch. 80 pages, illustrated. 2s 6d.

"Aircraft Radio and Electrical Equipment," by Howard K. Morgan, B.S. in E.E. 374 pages. 36s 9d.

"Radio Frequency Measurements By Bridge and Resonance Methods," by L. Hartshorn, D.Sc., A.R.C.S., D.I.C. 265 pages, diagrams. 40s.

"Radio-Frequency Electrical Measurements," by Hugh A. Brown. Second edition. 384 pages, illustrated. 32s.

(Continued on Next Page)

RADIO THEORY

"The Radio and Telecommunications Engineer's Design Manual," by R. E. Blakey, D.Sc. 142 pages, 84 illustrations. 24s 6d.

"On Resonance and Alignment." 91 pages, 48 diagrams. By John F. Rider. 1937. 7s 3d.

"Handbook For Wireless Operators." P.M.G.'s Handbook working installations licensed by His Majesty's Postmaster-General. Revised 1938. 1s 6d.

"The Outline of Wireless," by Ralph Stranger. 816 pages, 576 illustrations and diagrams. 19s.

"Radio Physics Course." An elementary textbook on electricity and radio. By Alfred A. Ghirardi, E.E. 974 pages, 508 illustrations. Eighth impression, June, 1937 37s 6d.

"An Elementary Wireless Course For Beginners," by J. H. Reyner, B.Sc., A.M.I.E.E. Third revised edition, 1937. 279 pages, 131 diagrams. 6s.

"Measurements In Radio Engineering," by F. E. Terman, Sc.D. 400 pages, 210 illustrations, tables, &c. First edition, fourth impression, 1935. 32s.

"Definitions and Formulae for Students of Radio Engineering," by A. T. Starr. 35 pages, illustrated. 10d.

"Wireless Telegraphy Notes for Students. (Covering the Postmaster-General's Air Licence for w/t operators.) Compiled by W. E. Crook. 188 pages, illustrated. 1938. 12s 6d.

"Radio Data Charts," by R. T. Beatty. Second edition. 8s 6d.

"Fundamentals of Vacuum Tubes," by A. V. Eastman, M.S. Second edition, 1941. 583 pages, fully illustrated. 36s.

"Communication Engineering," by W. L. Everitt, E.E., Ph.D. Second edition. 727 pages, 411 illustrations. 1937. 40s.

"Servicing Superheterodynes," by John F. Rider. Revised edition. 323 pages, illustrated. 8s.

"Automatic Frequency Control Systems," by John F Rider. 142 pages, 97 diagrams. 8s.

"Foundations of Wireless," by A. L. M. Sowerby, M.Sc. Second edition. 266 pages, diagrams. 10s.

"Learning Morse." An easy method of mastering the international signal code. 10d.

"Theory and Applications of Electron Tubes," by Herbert J. Reich, Ph.D. 688 pages, illustrated. 40s.

"Photo-Electric and Selenium Cells." Their operation, construction, and uses. By T. J. Fielding. Second edition. 163 pages, 82 illustrations. 14s.

"Wireless Terms Explained," by "Decibel." 72 pages. 4s.

"Theory of Thermionic Vacuum Tubes," by E. Leon Chaffee. 652 pages, 357 illustrations. 48s.

"The Cathode-Ray Tube At Work," by John F. Rider, 355 pages, illustrated. 24s.

"Radiologic Physics," by Charles Weyl, S. Reid Warren, jun., Dallett B. O'Neill, Moore. 459 pages. 36s.

"Aeronautic Radio." A manual for operators, pilots, radio mechanics. By Myron F. Eddy. 502 pages, 176 illustrations. 40s.

"Radio Engineering," by F. E. Terman. New second edition. 1938. 813 pages, 475 diagrams. 44s.

THE textbooks listed on these pages are those which you have a reasonable chance of obtaining in Australia. All inquiries in regard to the nature, price and availability should be addressed to one of our advertisers handling textbooks. The prices mentioned are given only as a general guide and are subject to fluctuation. Cost of postage must be added. Postage for an ordinary small handbook is about sixpence, rising to about 1s 6d for larger books.

"Practical Radio Communication," by Arthur R. Nilson and J. L. Hornung. 758 pages, illustrated. 1935. 40s.

"Principles of Radio Engineering," by R. S. Glasgow, M.S First edition, third impression. 1936. 520 pages, 344 diagrams. 32s.

"The Radio Engineering Handbook." Prepared by a staff of twenty-three specialists, Keith Henney, Editor-in-Chief. Third edition. 945 pages. 1941. 40s.

"Servicing Receivers By Means of Resistance Measurements," by J F Rider. 203 pages, 94 illustrations. 1932. 8s.

"Wireless Coils, Chokes, and Transformers, and How to Make Them," by F. J. Camm. 176 pages, 126 diagrams. 6s 6d.

"Theory and Design of Valve Oscillators for Radio and Other Frequencies," by H. A. Thomas, D.Sc., M.I.E.E. 287 pages, 103 figures. 40s.

"Mathematics Applied To Electrical Engineering," by A. G. Warren, M.Sc., M.I.E. F. Inst. P. 1906. 380 pages, 135 figures. 33s.

"Applied Acoustics," by Harry F. Olson, E.E., Ph.D., and Frank Masa B.S., M.Sc Second edition. 494 pages. diagrams. 40s.

"Electron Optics: Theoretical and Practical," by L. M. Myers. 618 pages, 380 illustrations. 88s 6d.

"The Radio Amateur's Handbook, 1942." Published by the American Radio Relay League. Nearly 600 pages, diagrams. 1942 edition. 11s.

"Radiotron Designer's Handbook." Published by the Amalgamated Wireless Valve Co. Pty. Ltd. Third edition, over 300 pages. 3s.

"The Radio Handbook 1942 Edition," by the Editors of "Radio," W. W. Smith, Editor-in-Chief. 600 pages, diagrams. 16s.

"Servicing By Signal Tracing," by John F. Rider. 360 pages, diagrams. 20s.

"The A.R.R.L. Antenna Book," by George Grammer and Byron Goodman. 140 pages, fully illustrated. 4s 6d.

"On Automatic Volume Control." 94 pages, 65 diagrams. By John F. Rider. 1937. 7s 3d.

"On D-C Voltage Distribution In Radio Receivers." 96 pages. By John F. Rider. 1937. 7s 3d.

"Alternating Currents In Radio Receivers," by John F. Rider. 94 pages, 71 diagrams. 7s 3d.

"Practical Wireless Circuits," by F. J. Camm. 168 pages, 113 illustrations. 6s 6d.

"Practical Wireless Service Manual." Edited by F. J. Camm. 295 pages, 221 diagrams. 10s 6d.

"Australian Official Radio Service Manual." Volume I. Complete service data of Standard 1937 Receivers with circuit diagrams. 392 pages, diagrams. 7s 6d or 10s.

"Australian Official Radio Service Manual." Volume II. Circuit book of Standard 1938 Australian receivers. 428 pages. Limp cover. 7s 6d.

"Australian Official Radio Service Manual. Volume III. Circuit book of Standard 1939 Australian receivers. 292 pages. Limp cover 12s 6d, cloth cover 15s.

"Australian Official Radio Service Manual." Volume IV. Circuit book of Standard 1940 and 1941 receivers. 332 pages. Limp cover 12s 6d, stiff board cover 15s.

"International Code of Signals, 1931." Volume I. For visual signalling. 28s 6d.

"International Code of Signals, 1931." Volume II. Radiotelegraphy. 28s 6d.

"Modern Aircraft Radio," by Willis L. Nye. 346 pages, 249 illustrations. 30s.

"Modern Radio Communication," by J. H. Reyner, B.Sc. (Hons.), M.Inst.R.E. Volume I. 343 pages, illustrations. 12s 3d.

"Modern Radio Communication," by J. H. Reyner, B.Sc., A.C.G.I., D.I.C., A.M.I.E., M.Inst.R.E. Volume II Third edition. 255 pages, 141 diagrams. 12s 6d.

"Radio Directing," by Earle McGill, Casting Director, Director and Producer, Columbia Broadcasting System. 370 pages, illustrated. In this book the author covers in a sound, practical manner the fundamental problems involved in the production of radio programmes. 28s.

"Radio Advertising in Australia," by W. A. McNair, M.Com Dip.Sec. Sc., AAIS, ARA, RANZ. The author obtained and analysed the opinions of more than 5000 representative Australian listeners. 461 pages. 35s for 12s 6d.

DO CIRCUIT DIAGRAMS PUZZLE YOU?

One of the greatest difficulties which beginners encounter is that of understanding schematic circuit diagrams. Although they may be rather bewildering at first glance, schematic circuits are really not hard to follow, once you grasp the general idea. The following remarks should be helpful to those who still regard them with a certain amount of awe.

A GREAT many of our readers construct receivers and amplifiers by following the underneath wiring diagrams. which we usually publish. It is more than our life is worth to publish a circuit without the accompanying wiring diagram. As you may guess, we don't like wiring diagrams, because they are so tedious to draw.

However, we comfort ourselves with the thought that they act as stepping-stones and aid the novice until such times as he is able to work from the more professional schematic diagrams.

With a wiring diagram, it is almost impossible to analyse or sum up a circuit quickly. Even to the trained eye it is a jumbled mass of leads, each one of which has laboriously to be traced out.

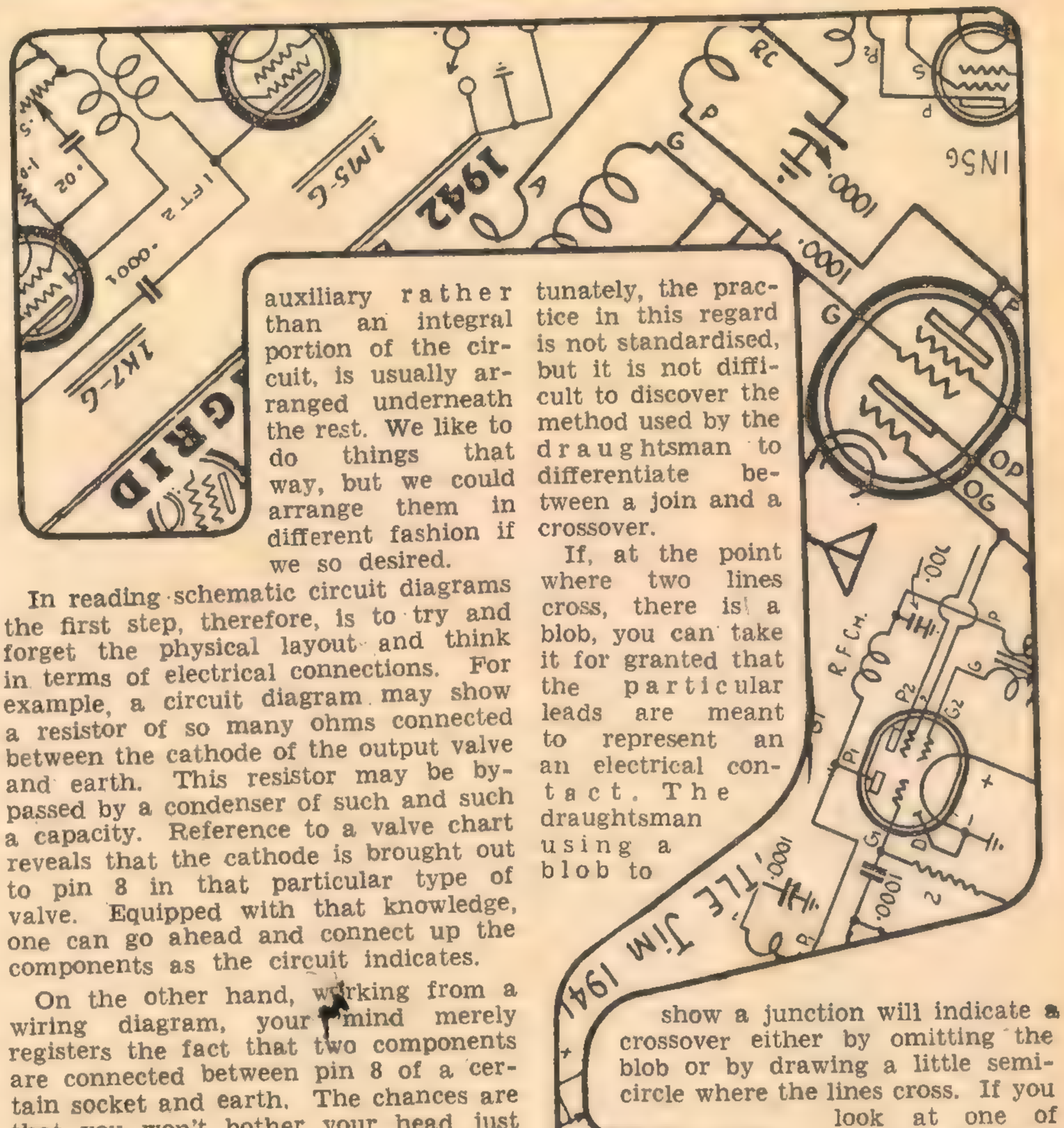
On the other hand, when once one has become used to reading schematic circuit diagrams it is possible to look over one of these and, within the space of a few seconds, to grasp the general outline of a circuit.

GENERAL HINTS

Schematic circuit diagrams have been called the shorthand of the radio technician. In a schematic circuit full stress is laid on the electrical connections, little or no attention being paid to the physical layout or appearance of the components.

As a rule, for the sake of clarity and convenience, a circuit diagram is drawn in an orderly fashion, so that the progress from left to right, or from right to left, as the case may be, follows the general progress of the electrical circuit.

In "Radio and Hobbies" circuits we usually arrange for the input or aerial terminal to be on the extreme left, arranging the stages in order until we reach the loudspeaker on the extreme right. The power supply, being an auxiliary rather than an integral portion of the circuit, is usually arranged underneath the rest. We like to do things that way, but we could arrange them in different fashion if we so desired.



In reading schematic circuit diagrams the first step, therefore, is to try and forget the physical layout and think in terms of electrical connections. For example, a circuit diagram may show a resistor of so many ohms connected between the cathode of the output valve and earth. This resistor may be by-passed by a condenser of such and such a capacity. Reference to a valve chart reveals that the cathode is brought out to pin 8 in that particular type of valve. Equipped with that knowledge, one can go ahead and connect up the components as the circuit indicates.

On the other hand, working from a wiring diagram, your mind merely registers the fact that two components are connected between pin 8 of a certain socket and earth. The chances are that you won't bother your head just how the components fit into the electrical circuit.

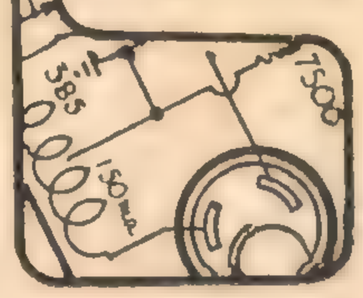
STRAIGHT LINES

The very reasoning, which one does automatically when working from a schematic circuit diagram, is valuable, although we may not realise it at the time.

All circuit diagrams are built around straight lines. Continuous lines are used to represent electrical connections. The only exception to this rule is when a line forms part and parcel of a symbol, as, for example, when it represents the iron core of a transformer.

When the lines in a circuit diagram cross one another the draughtsman has to make it plain whether or not the lines are meant to make a junction at the point of intersection. Unfortunately, the practice in this regard is not standardised, but it is not difficult to discover the method used by the draughtsman to differentiate between a join and a crossover.

If, at the point where two lines cross, there is a blob, you can take it for granted that the particular leads are meant to represent an an electrical contact. The draughtsman using a blob to show a junction will indicate a crossover either by omitting the blob or by drawing a little semi-circle where the lines cross. If you look at one of the "Radio and Hobbies" circuits you will see that we use a blob to indicate a junction and a semi-circle to indicate a crossover.



Some draughtsmen do not use a blob to indicate a junction, but simply allow the lines to intersect. This is in direct contradiction to the previously stated method, but it need not be confused, because a crossover would necessarily have to be indicated in the latter case by a small semi-circle.

This is really not as complicated as it may sound. It simply amounts to inspecting the particular circuit under observation and noting the method the draughtsman has adopted to differentiate between junctions and crossovers.

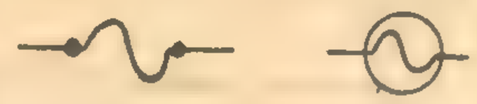
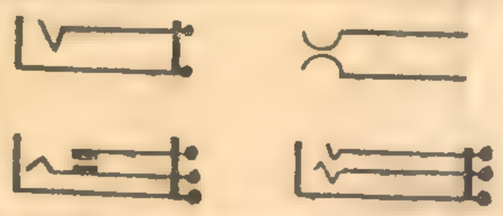
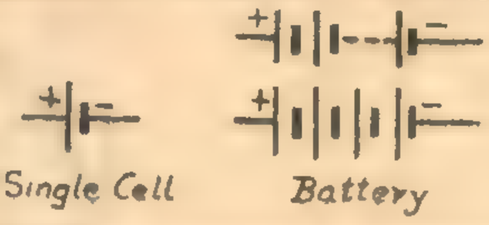
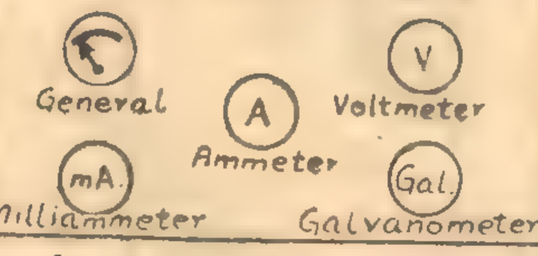
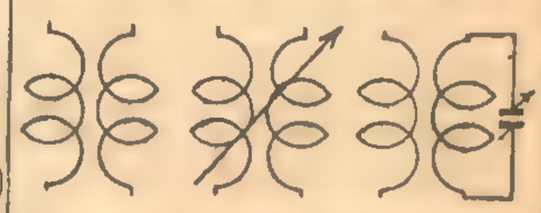
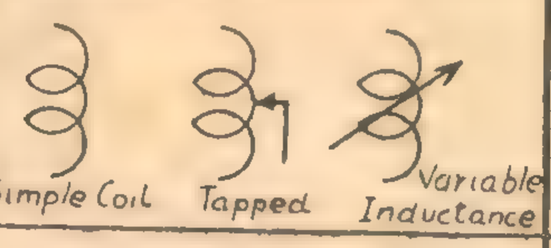
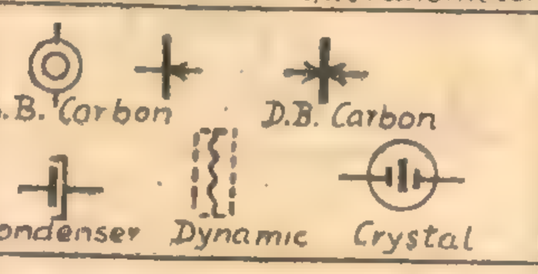
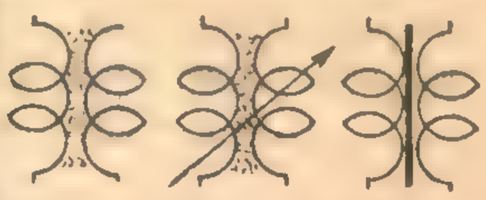
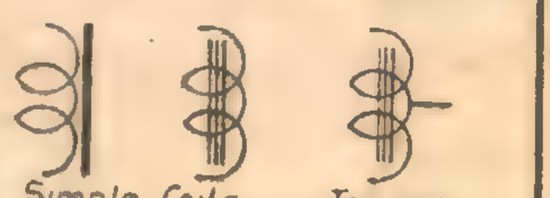
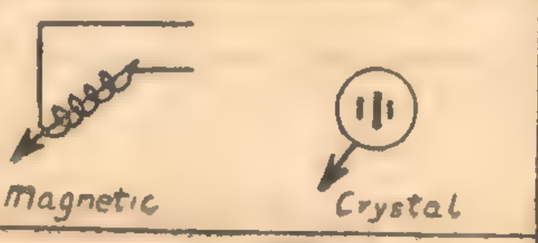
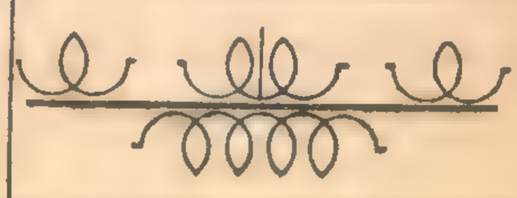
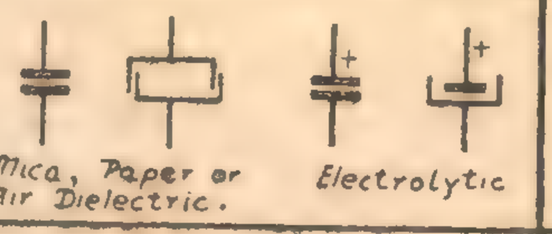
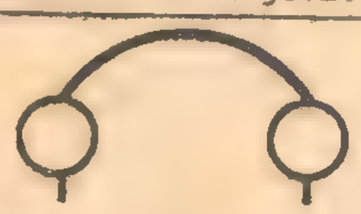
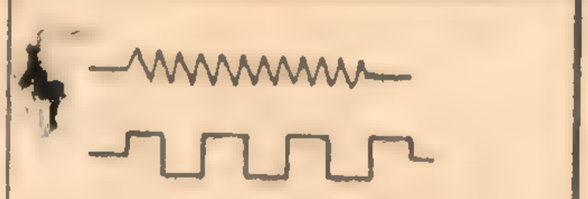
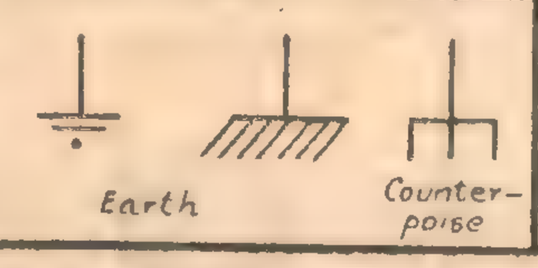
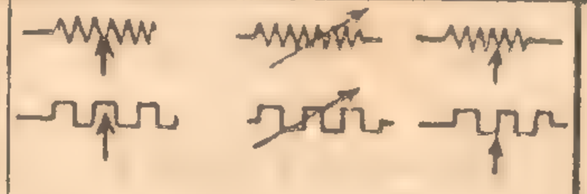
All points in a schematic circuit diagram, which are joined together by a solid line, have to be joined in the completed receiver or amplifier. Have a look at any one of the larger "Radio and Hobbies" circuits and see if you can pick out the B plus line.

You will note that every here and there other heavy lines join it. Some

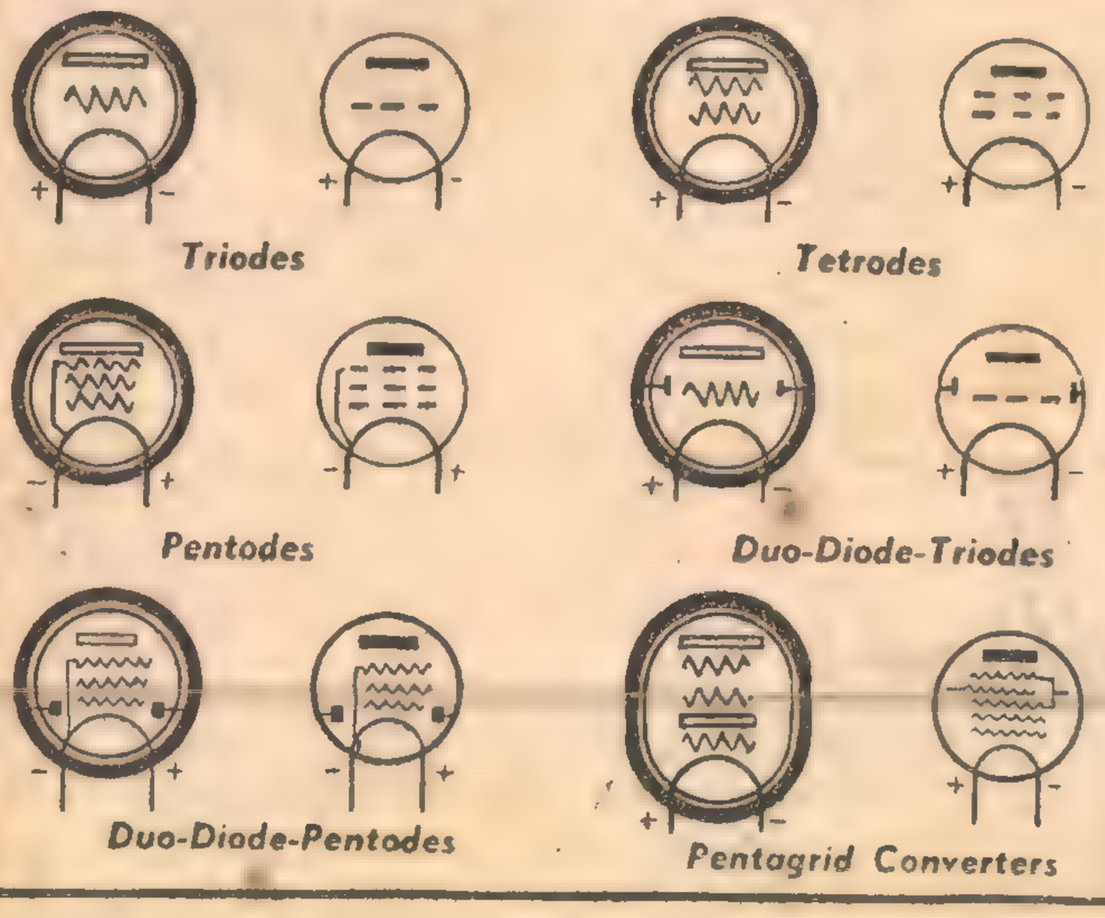
(Continued on Page 25)

by W. N. Williams

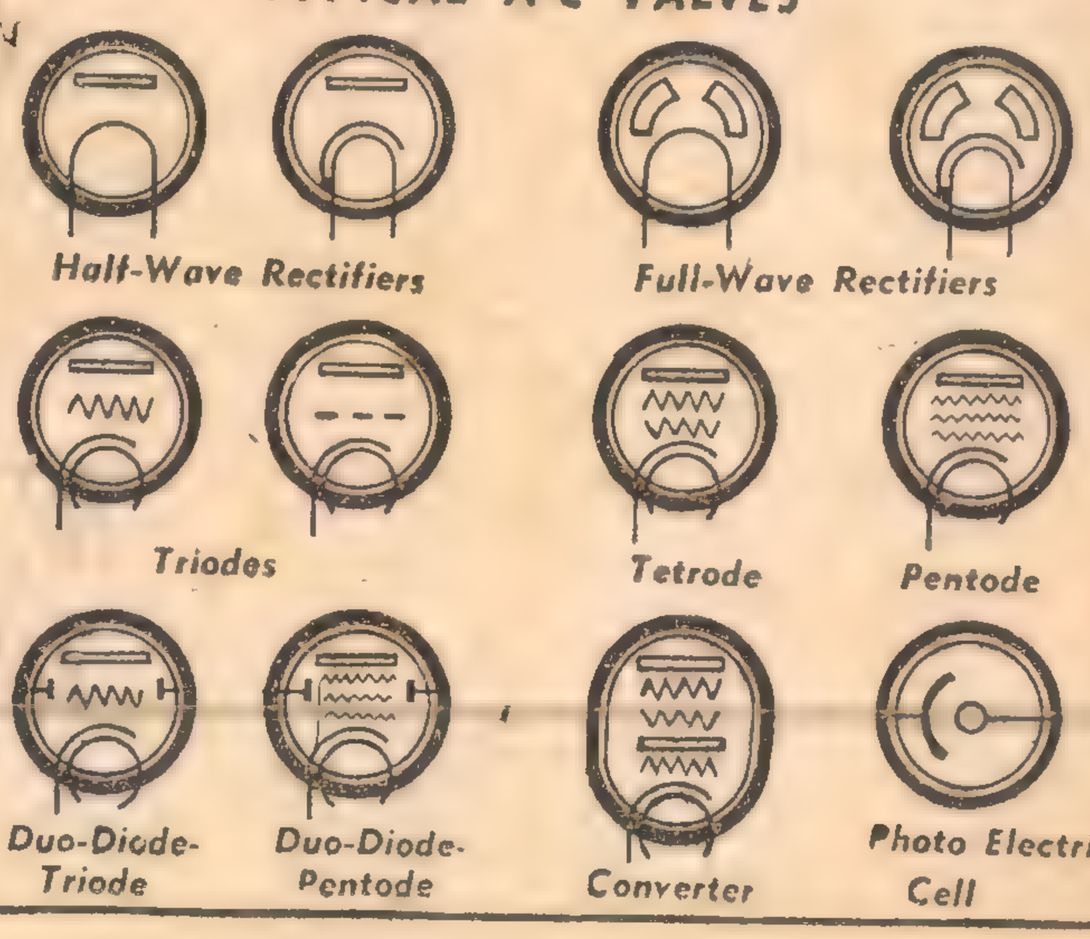
TYPICAL SYMBOLS FOR CIRCUIT DIAGRAMS

AERIAL		FUSE		LOUD-SPEAKER	
AERIAL (Special Types)	 Doublet Aerials Loop	JACKS (Phones or Speaker)		SWITCHES	 Off-On Two-way Multi-point
BATTERY	 Single Cell Battery	METERS	 General Voltmeter Ammeter Milliammeter Galvanometer	TRANS-FORMERS (Air-Cored)	
CHOKES or COILS (Air-Cored)	 Simple Coil Tapped Variable Inductance	MICRO-PHONES	 S.B. Carbon D.B. Carbon Condenser Dynamic Crystal	TRANS-FORMERS (Iron-Cored)	
CHOKES or COILS Iron-Cored)	 Simple Coils Tapped	PICKUPS	 Magnetic Crystal	POWER TRANS-FORMER	
CONDENSERS (Fixed)	 Mica, Paper or Air Dielectric. Electrolytic	PHONES		VOLTAGE DIVIDER	
CONDENSERS (Variable)	 NB. The moving Plates are usually Connected to "earthy" side of circuit	RESISTORS (Fixed)		WIRES JOINED	
EARTH or GROUND	 Earth Counter-poise	RESISTORS (Variable)		WIRES CROSSING	

TYPICAL BATTERY VALVES



TYPICAL A-C VALVES



WHEN WIRING VALVE SOCKETS:—

For the sake of convenience, valve socket connections are often numbered 1, 2, 3, 4 and so on. The usual method of numbering is as follows:

Looking on to the pins of the valve or on to the connections underneath a socket, hold it so that the filament pins are nearest to you. The filament pin to your left is pin 1; counting in a clockwise direction, the other pins follow in order. In the case of an octal socket, hold the keyway towards you and commence counting from the pin to the left of keyway.

When looking at a socket from above, you have to commence counting from the pin on the right and count in an anti-clockwise direction.

This point is often overlooked.

of these convey the B plus voltage to components which allow the voltage to be passed on to the plates of the different valves. From another point the voltage may be conveyed to a series resistor, or a divider network of resistors feeding the screen grid of one or more of the valves.

In the same way, you may be able to trace out the supply line to the screens of several valves, or, again, the AVC line.

LEADS IN CHASSIS

The fact that the B plus supply, for example, may be represented as a single heavy line with leads taken off at certain points, has no bearing on the physical arrangement of the wires in the completed receiver or amplifier.

It would, of course, be possible to run a single B plus lead around the chassis, taking off the various connections, but that is not necessary. All that is necessary is to see that the B plus supply ultimately reaches each of the components to which it is shown connected in the circuit diagram. The manner in which the various points are connected together, or the route taken by the wire, is of secondary importance.

The same goes for all the other leads in a receiver.

WIRING VALVE SOCKETS

Connection to the different electrodes of a valve is made by means of a valve socket. If you do not know them offhand, you can obtain the pin connections for the various types of valves from valve data charts.

From the circuit diagram you see that certain connections are to be made to the plate, to the cathode, and to the various grids. By consulting valve data charts it is possible to find out to which pins the various electrodes are brought out and the socket is wired, so that the appropriate connections are made when the valve is plugged in.

Note that valve connections are usually depicted looking on to the pins of a valve or on to the lugs underneath the socket. If you happen to be wiring a socket from above, take care to number the pins in the reverse direction.

In most receivers the connections to the speaker are made, for the sake of convenience, through a four or five pin plug and socket. The speaker socket must be wired in such a way that the appropriate connections are made when the speaker is plugged in. The connections to the speaker plug can be ascertained by inspection, or by consulting the manufacturer.

In general, it is unimportant which way round the field or input transformer are connected. However, care must be taken to see that the leads to the field are not mixed up with those going to the input transformer.

CIRCUIT SYMBOLS

So much for the lines in a circuit diagram. The symbol used to represent the various other components usually employed in receivers or amplifiers are shown on the opposite page.

You will note that there are alternative methods of depicting the various components. The lack of standardisation is unfortunate, but understandable. We haven't shown all possible alternatives, but we have shown the most important. As one becomes more used to reading circuit diagrams one becomes more able to cope with the many whims of engineers and daughtsmen.

In general, the symbols bear a relationship to the properties of the component, although they may not always call to mind the physical appearance. In the symbols for the aerial and earth, for the phone jack, or the earphones, the relationship to the physical appearance is apparent.

In the case of a condenser, the symbol clearly represents two metal plates in proximity, but not in contact with each other. The symbol for a resistor is also suggestive. Again, the symbol for a coil obviously suggests a coil of wire.

VARIABLE PROPERTIES

An arrow drawn through a component usually indicates that its properties are variable. Thus, we have a variable condenser or a variable resistor. Similarly, we may come across a coil having variable inductance, or two coupled coils in which the degree of coupling is variable.

An arrow butting on to one side of a component usually indicates a tapping, which may be either fixed or adjustable. The symbol for a switch involves an arrow and a number of terminal points.

The usual symbol for a transformer is two coils arranged back-to-back. Transformers having an iron core are depicted in the same way, but with a heavy line, or several lighter lines, between the two coils. Alternatively, the core may be depicted by a collection of dots, or the transverse lines may be drawn through the individual coils instead of between them.

Air-cored chokes are depicted in the same way as a tuning coil. Iron-cored chokes usually have one or more lines drawn lengthwise through the windings or alongside the windings.

One could go on for a long time discussing the various symbols, but we suggest that you study each one in turn and try and pick out the relationship which the symbol bears to the component which it represents.

VALVE SYMBOLS

At the foot of the opposite page we have drawn out a few typical symbols for various types of valves. The symbols only represent a fraction of the number of symbols which have been used to depict different valves. We suggest that you try to understand the general principles of valve symbols rather than merely to memorise the few that we have drawn.

Here are a few general hints: Plates are usually represented by an open or solid black rectangle. Sometimes a short heavy line is used. Grids are shown either as dashed lines or as zig-zag lines similar to those for resistors.

The heater of an A-C valve, if drawn in at all, is represented by a semi-circle; the cathode either as a heavy horizontal line or as a heavy arc concentric with the heater. Filaments of battery valves are usually shown as a semi-circle.

The various electrode symbols may

(Continued on Next Page)

(Continued from Previous Page)

be enclosed in a heavy or light circle, in two concentric circles, in an oval, in a rectangle, or they may not be enclosed at all. Don't worry about the shape of the enclosures around the valve symbol, because they have no particular significance.

In valve symbols some attempt is usually made to depict the progression of the electrodes between cathode and plate. However, there are many inconsistencies in this and too much reliance cannot be placed on the symbols.

A better guide is to examine the complete circuit, from which it will be fairly obvious which grid is which. In the case of complicated and unusual valves, such as certain converters, the connections are not always apparent. If you can't make head nor tail of the connections to some of these valves, do not be unduly disappointed; you won't be the first one to be worried by them—not by a long way!

NOT ENTIRELY COMPLETE

The subject of valve types and symbols is sufficiently wide to warrant a special article, but space does not permit us to go into greater detail at this juncture. Sufficient to say, that the understanding of valve symbols is one of the most difficult features of schematic circuit diagrams.

The ordinary schematic circuit diagram leaves a certain amount to the imagination, or, should we say, to one's technical perception. For example, it is seldom that the complete heater or filament circuit wiring is shown. It is usually taken for granted that the constructor realises the necessity and the method of connecting the heaters or filaments.

In multi-band receivers the coil switching is seldom shown, unless changing from one band to another involves a change in the electrical circuit. A single set of coils is usually shown in position, it being assumed that the constructor understands that band-switching is a necessity.

> Having read through these pages, turn to the constructional articles to follow and carefully study each of the simple circuit diagrams. Try and identify the various components and trace out the general trend of the circuit. If you proceed to build up one of the small receivers, try and work from the circuit diagram, referring to the underneath wiring diagram only when something has you stumped.

Seldom is any attempt made to letter or code the connections to the coils in a circuit diagram. However, the actual components are usually coded and the various connections can be traced out on the circuit.

The actual style of coil, whether air— or iron—cored, or whether permeability tuned or otherwise, may or may not be depicted. The designer may draw the circuit in the simplest fashion and cover these points in the accompanying article, or the choice of components may be left to the constructor. These remarks apply to tuning coils, but more particularly to I-F transformers.

These and other details which a schematic circuit leaves to the imagination of the reader, makes it rather difficult for the non-technical person to follow it.

Thus, if you are only a beginner in radio, and you cannot follow a schematic circuit very well, do not become discouraged. These diagrams will take on greater significance as your technical knowledge increases.

A FINAL WORD

In the meantime, carefully study each schematic circuit which you come across and compare it to the wiring diagram. Compare the connections to the valve electrodes and to the socket pins, at the same time making reference to diagrams in the valve data charts.

See if you can follow the general trend of the circuit, picking out the individual stages and the supply lines to the plates and screens, the A.V.C. line and so on. In this way you will help yourself to understand not only schematic circuits but the operation of radio receivers generally.

If you have not in the past been able to read schematic circuit diagrams, this article will not completely solve your problems—but we trust that it will put you on the right track.

A SIMPLE CYRSTAL SET FOR BEGINNERS

If you live within twenty miles or so of a broadcasting station, probably the best way to make a start in radio is to build up a small crystal set. Crystal sets are cheap and easy to construct and serve to teach one the elementary lessons in regard to receiver construction.

EMPLOYING no valves or batteries and having no connection to the power mains, there is little chance of the beginner harming either himself or his components.

Crystal sets cost nothing to operate—apart from the very necessary item of a broadcast listener's licence. Simply connect the aerial and earth, plug in the earphones, make the necessary adjustments, and away they go until further notice.

Even if there is a larger receiver in the home, the crystal set can be rigged up at the head of the bed. When, late at night, your roommates punctuate their slumber with snores, you are then able to drown the unpleasant noise with snatches of hot rhythm.

However, don't run away with the idea that a crystal set will give free reception of all the local stations in a manner to rival the domestic receiver, which probably includes five or six amplifying valves. A crystal set has no amplification whatever and delivers audio voltages to the headphones only in proportion to the strength of the signals received at the aerial.

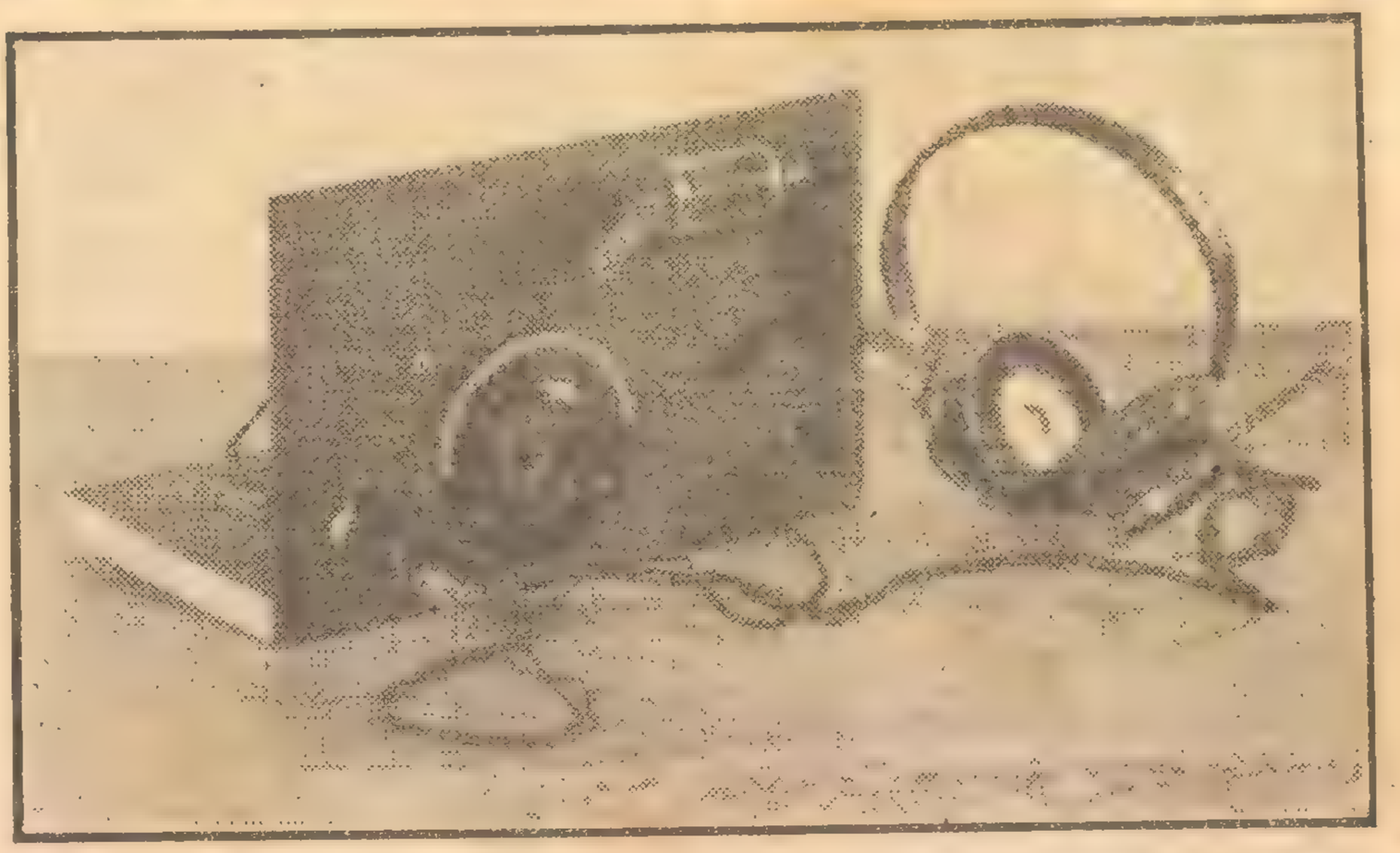
GOOD AERIAL AND EARTH

The first essential with a crystal set is, therefore, an effective aerial and earth. Space does not permit a lengthy discussion of what constitutes a good aerial and earth. However, you have probably read one of the numerous articles which have been published on the subject from time to time.

An aerial for a crystal set should preferably be erected in the open, well clear of trees or large masses of metal. It should be about 50ft. long and at least 12ft. or 15ft. high. Actually, the higher it is the better.

Where the signal strength from the stations is high, an indoor aerial under other than an iron roof may be made to serve the purpose, although it is not ideal.

For the earth, seek out the nearest water pipe, scrape it clean and fasten a lead to it by means of a brass earthing clip, sold for the purpose. If a water pipe is not handy, solder a wire to a kerosene tin or to a piece of galvanised iron and bury the latter in a spot which keeps fairly moist. Another plan is to drive a length of iron pipe into the ground in a moist spot, connecting the earth lead to the exposed end.



Here is the crystal set described in this issue. The base is of wood and the front panel of masonite. Note the adjustable crystal mounted on the front panel; the aerial and earth terminals are to the right beneath it. An ordinary direct-drive dial is quite satisfactory for tuning.

It is well worthwhile spending a little time and effort to erect a good aerial and earth system. It will pay dividends, not only with this crystal set, but with other small receivers which you may construct at a later date.

The construction of a crystal set is simplicity in itself and the following instructions should make it possible for almost anyone to get one into operation.

MANY DESIGNS

There are a wide variety of ways of building up crystal sets. We have chosen a particular design and method of construction which lends itself to the present requirements. If, at a later date, you come across other constructional articles, you can try out the various designs, one after the other

For the crystal set, here described, the base was an ordinary piece of clean board measuring 9in. x 5in. x ⅞in. The front panel was a piece of ⅛in. reinforced masonite measuring 9in. x 5⅝in. The masonite panel may be screwed or tacked to one of the longer edges of the baseboard.

The dimensions mentioned are not at all critical and may be varied to suit yourself.

LIST OF PARTS

1 Wooden base, 9 x 5 x ⅞.
1 Masonite panel, 9 x 5⅝ x ⅛.
1 Crystal assembly.
1 Direct-drive dial.
2 Terminals.
1 Phone jack.
1 .0005 mfd tuning condenser.
1 .001 mfd mica condenser.
1 Coil former, 6in. long, 2in. diameter.
1 Bakelite terminal strip (as per article)
3 Alligator clips.
1 Pair headphones and plug.
Hook-up wire and sundries.

CRYSTAL DETECTORS

Now to discuss the various components. Crystal detectors may be classified under the two main headings, namely, the fixed detector and the adjustable. There are good and bad detectors in each variety, but we rather prefer the adjustable, if only because it gives the experimenter something else to play with.

With the adjustable detector, you will find a small piece of crystal held in some suitable locking device and enclosed in a glass tube, to protect it from dust and grease. Bearing on its surface and capable of adjustment is a small coil of wire, which some wiseacre long ago called a "cat's whisker."

In operation, the catswhisker needs to be adjusted until it rests lightly on some point on the surface of the crystal which gives the loudest signals in the phones. This adjustment is quite delicate, and needs to be done carefully for the best results. The number of sensitive points on the surface of a crystal varies with the crystal itself.

TWO CONNECTIONS

Small pieces of crystal may be bought in radio shops for a few pence. Note that these are not the complete assembly. If you look at the first photograph you will see a typical crystal de-

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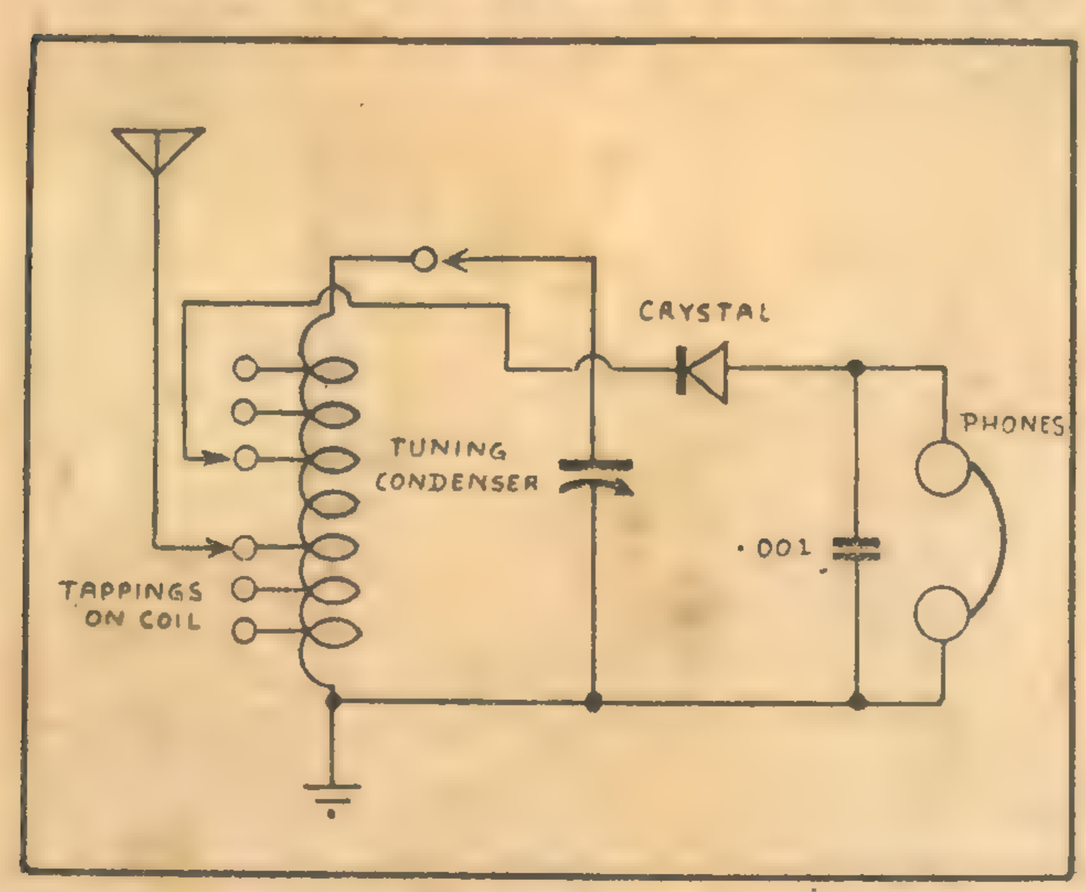
CONSTRUCTION

SCHEMATIC CIRCUIT DIAGRAM



Here is the schematic circuit diagram for the crystal set. Below is the underneath wiring diagram—just in case the schematic has you stumped. Compare the two carefully and see whether you can pick out the equivalent leads.

tector unit mounted on the front panel of the completed receiver.

There are only two connections to a crystal detector unit. One goes to the crystal itself, and the other to the catswhisker. You should have no difficulty in locating these connections by inspection.

It does not matter which way round the unit is connected into the circuit. If you have occasion to handle the crystal itself, do so carefully, and see that the surface is not made greasy or dusty by contact with your fingers.

THE PHONE JACK

Connections to the earphones was made through a phone jack. There are a wide variety of phone jacks to be bought. Some have only two connections; others are designed to perform switching operations when the phones are inserted, and they may have four or five connections.

For the crystal set, almost any jack will serve the purpose. If a multiple jack is used, the switching connections may be neglected.

In an ordinary phone plug, one of the leads from the phones connects to the stem of the plug, the other lead connecting to the insulated tip. If you push the phone plug into the jack you will be able to note which of the spring leaves in the latter makes contact with the stem of the plug and which contacts the tip.

The jack may then be wired accordingly. Once again, it is immaterial which way round the phones are connected into the circuit.

CHECK THE CONTACTS

The phone jack is mounted by drilling a suitable hole in the front panel When it is finally locked in place, push the phone plug in and see that the spring leaves make proper contact with both the stem and the tip

If you feel so disposed you can do without the phone jack and include a couple of extra terminals on the panel for the connection of the phones. Note that the phones should be of a sensitive type in order to give the best output with the limited signal voltage available.

On the right-hand side of the front panel you will note two terminals. The upper terminal is for the aerial connection, the other for the earth. Since the panel is made of an insulating material, the terminals may be mounted directly on to it.

Don't be like one correspondent who complained bitterly that one of our small receivers would not work and caused his batteries to heat up. Investigation showed that he had made up a very imposing terminal strip for all the connections—out of aluminium! Everything was shorted to everything else.

Tuning of the crystal set is achieved by means of a variable condenser. The condenser should have a maximum capacity of between .0004 and .0005 microfarads. Some condensers have the capacity stamped on them, others leave it to your imagination.

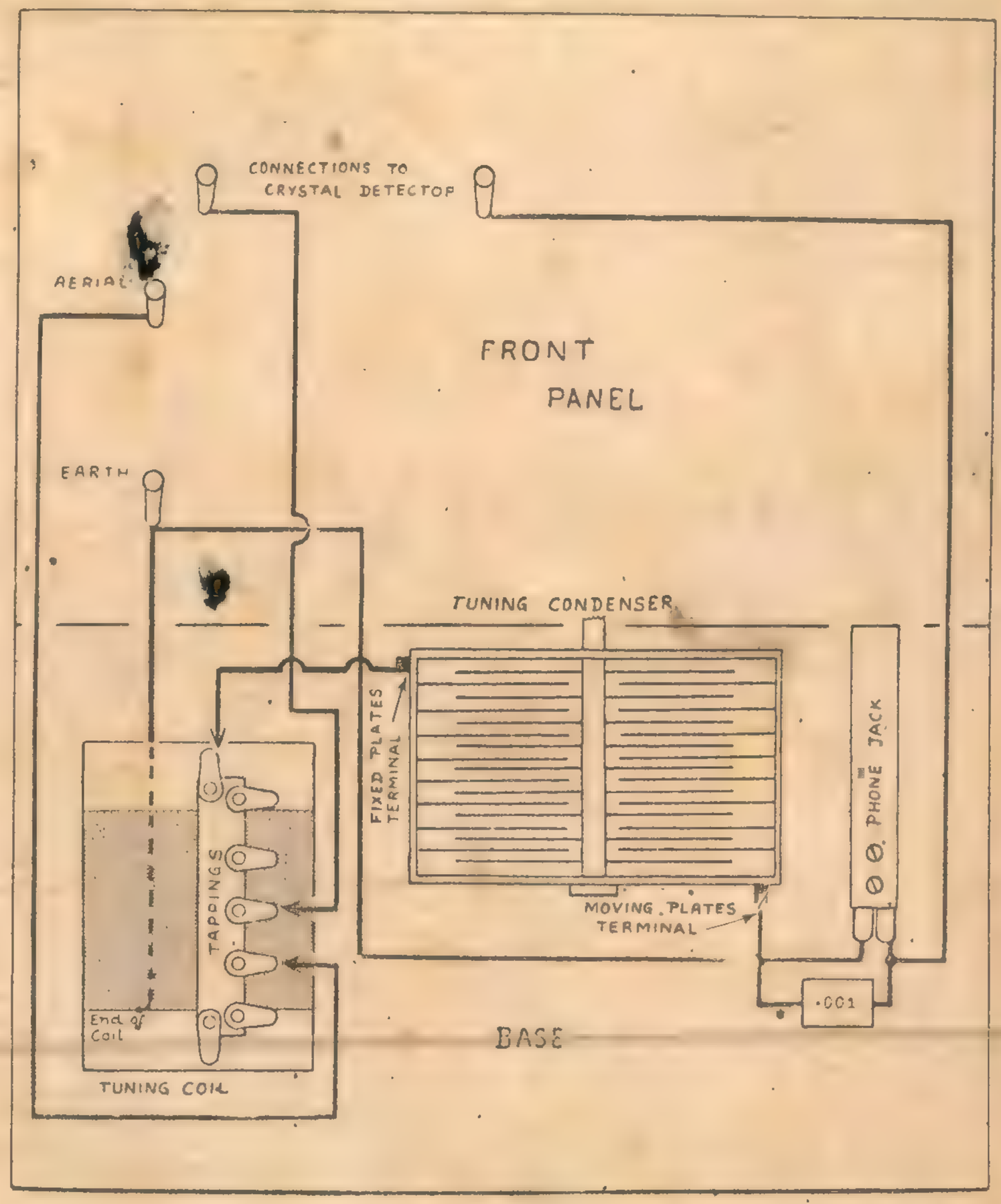
If you have a condenser on hand and you are not sure of its maximum capacity, ask a radio dealer or serviceman about it, and he will probably be able to make an intelligent guess at the capacitance by noting the size, number and spacing of the plates.

CONDENSER AND COIL

The tuning condenser for a crystal set does not need to be either an electrical or a mechanical masterpiece. Some mechanical sloppiness or slight electrical losses matter little, because the tuning is broad in any case, and the tuned circuit is heavily loaded by the aerial and crystal.

Simply adjust the condenser until it works smoothly, and see that none of the moving (or rotor) plates touch the fixed (or stator) plates as the condenser is rotated. The condenser should be connected into the circuit so that the moving plates go to earth and the stator plates to the "hot" end of the coil.

The condenser will probably have a couple of terminals for the connections. You should be able to discover which is which by inspecting it. If there are no actual terminals, it is usually possible



to fit a couple of solder lugs under assembly nuts.

Condensers having a maximum capacitance of less than about .0004 microfarads are not entirely suitable, since it becomes impossible to cover the band in a single sweep of the dial.

The final item which remains to be discussed is the tuning coil. The circuit calls for a coil having a liberal number of tappings brought out to lugs on a terminal strip.

WINDING DATA

The coil is wound on a two-inch diameter former with 24 B & S gauge copper wire. Other wire of similar gauge or with different insulation could be used, although the winding space required would differ. If you purchase about six inches of coil former, you can begin winding about half an inch from one end, trimming off the bulk of the unused former at the other end, when the winding is complete.

The original coil consisted of 75 turns in all, tapped at 10, 20, 30, 45, 55, and 65. The tappings were brought out to lugs riveted to a strip of bakelite. The bakelite strip was mounted on top of the coil by standing it up on two bolts through either end of the former.

The terminal strip was obtained by snipping one side from a section of ordinary resistor panel. There were five lugs on the side, and, by putting a solder tag under each of the two mounting bolts we were provided with anchorages for the six tappings and for the "hot" end of the coil. The other end of the coil was not anchored to a lug, being connected permanently to the earth terminal.

TAPPINGS ON COIL

The method of bringing out the tappings from the winding is not difficult. Firstly, the desired number of turns to the first tapping is wound on. The wire is then kinked and twisted a few times so that it forms a short pigtail sticking out from the body of the coil.

Then additional turns are wound on, tappings being arranged at the necessary points. Try and avoid kinking the wire too severely where the pigtail protrudes from the coil, as the insulation may crack off and cause it to short-circuit to the turns on either side.

Also, avoid bending the tappings about as you complete the remainder of the winding. If the wire happens to break in the middle of a coil, you may have to rewind the whole coil.

The end of the coil may be anchored by drilling two holes in the former about half an inch apart and looping the wire through the holes a couple of times.

COMPLETING THE COIL

When the winding has been completed carefully clean the insulation from the end of each pigtail tapping with a piece of sand or emery paper. Slip a short length of spaghetti over the twisted tapping and solder each one to the respective lug on the terminal strip.

If you have some shellac or coil "dope" on hand it may be applied to the coil to keep the turns in place.

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a parallel fixed capacitance of about .00015 mfd.

The idea is first to cover the high frequency end of each band with the ordinary tuning condenser and then to switch in the parallel capacitance to receive the stations on the low frequency end of the band.

MECHANICAL CONDITION

Whatever condenser you use, it should be in good mechanical order, particularly if you intend to try and receive stations on the shortwave bands. Go over it carefully, cleaning all the dust and grit from the plates. See that the plates are not touching anywhere and that it moves smoothly without binding or without being sloppy.

The condenser will need to be mounted according to its design. Some mount on the baseboard only, some on the panel and some have provision for attaching to both.

When you come to mounting it, see that it is quite firm and that rotation or pressure on the dial does not warp the plates or affect the spacing between them.

The condenser has two connections, one to the rotor plates and one to the stator plates. It is a good idea to locate these connections before you mount the condenser in place. Note that the rotor plates should be earthed and not the stator plates.

WIRELESS TRANSMITTING APPARATUS

The Deputy Director, Posts and Telegraphs (Mr. R. W. Hamilton) advises that cases have come under notice where suppliers and manufacturers have not complied with Regulation 11 (1A) of the National Security (General) Regulations, by disposing of, or acquiring Wireless Trasmitting apparatus, which includes certain electro-medical apparatus, without the necessary permits having been obtained from the Senior Radio Inspector. Heavy penalities are provided under the National Security Act for non-compliance with the Regulation.

For tuning, a slow-motion dial is almost a necessity. The one pictured on the set is a rather modern type available either with station call signs or with a numerical scale. The latter is the most generally useful for a receiver of this kind.

TYPE OF DIAL

Although a modern dial looks pleasing to the eye, one of the many excellent front-of-panel dials, so popular a few years ago, may be used. The essential features are a good vernier action, freedom from backlash, and freedom from jumpiness.

The holes in the panel and the position of the condenser naturally have to be arranged to suit the particular dial used. Fortunately, masonite is a very easy material to work, and, even if you mess it up completely the first time, it is sufficiently cheap to permit

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Figure 3.—Here is the complete schematic circuit of the one-valve receiver. As you see, it is not at all complicated and will be found quite easy to follow once you get the idea of things. Below is figure 4, the underneath wiring diagram. The contrast between the two is very apparent.

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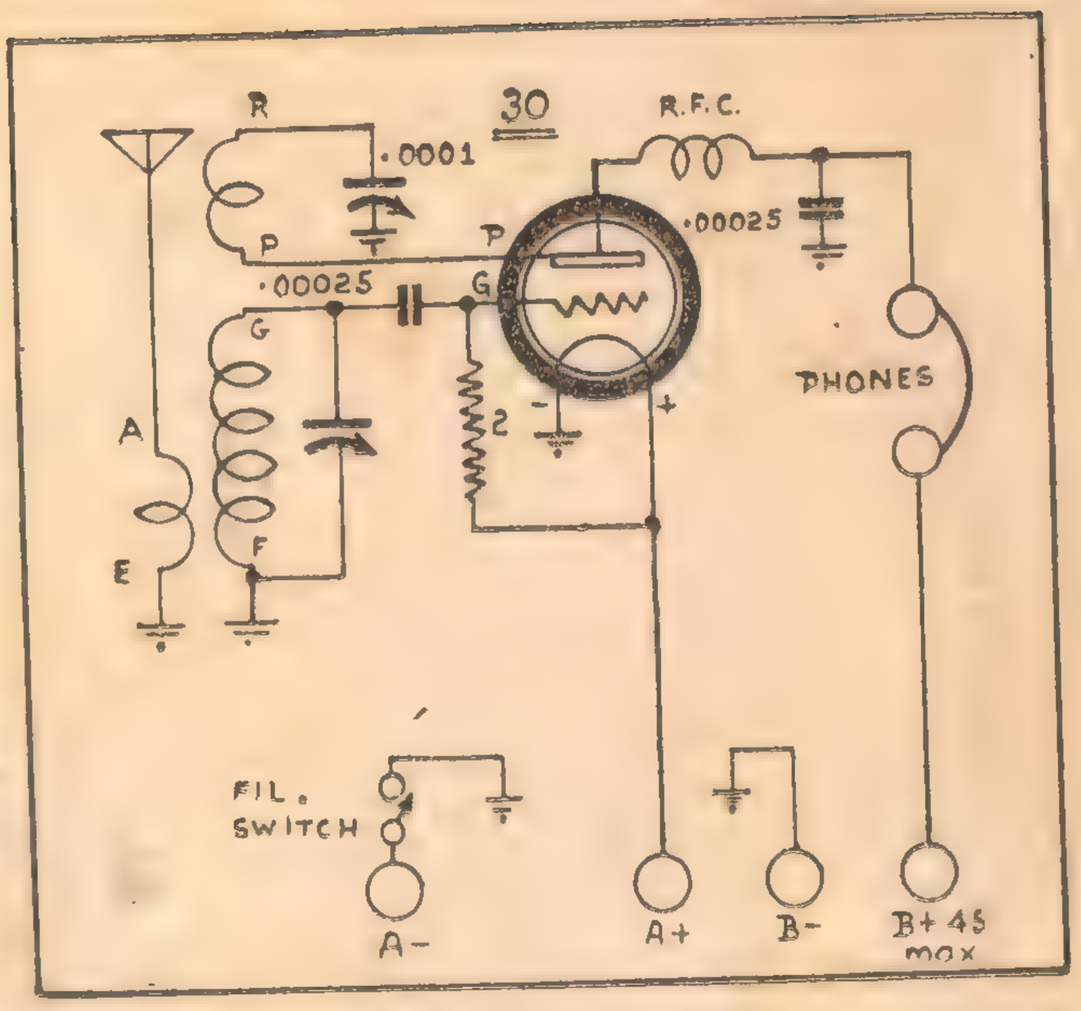


one to start all over again with a new piece.

The reaction condenser should have a maximum capacitance of about .0001 mfd. In the case of a midget condenser, this usually means about .23 plates in all. Our condenser had rather larger plates than usual, and there were only nine in all.

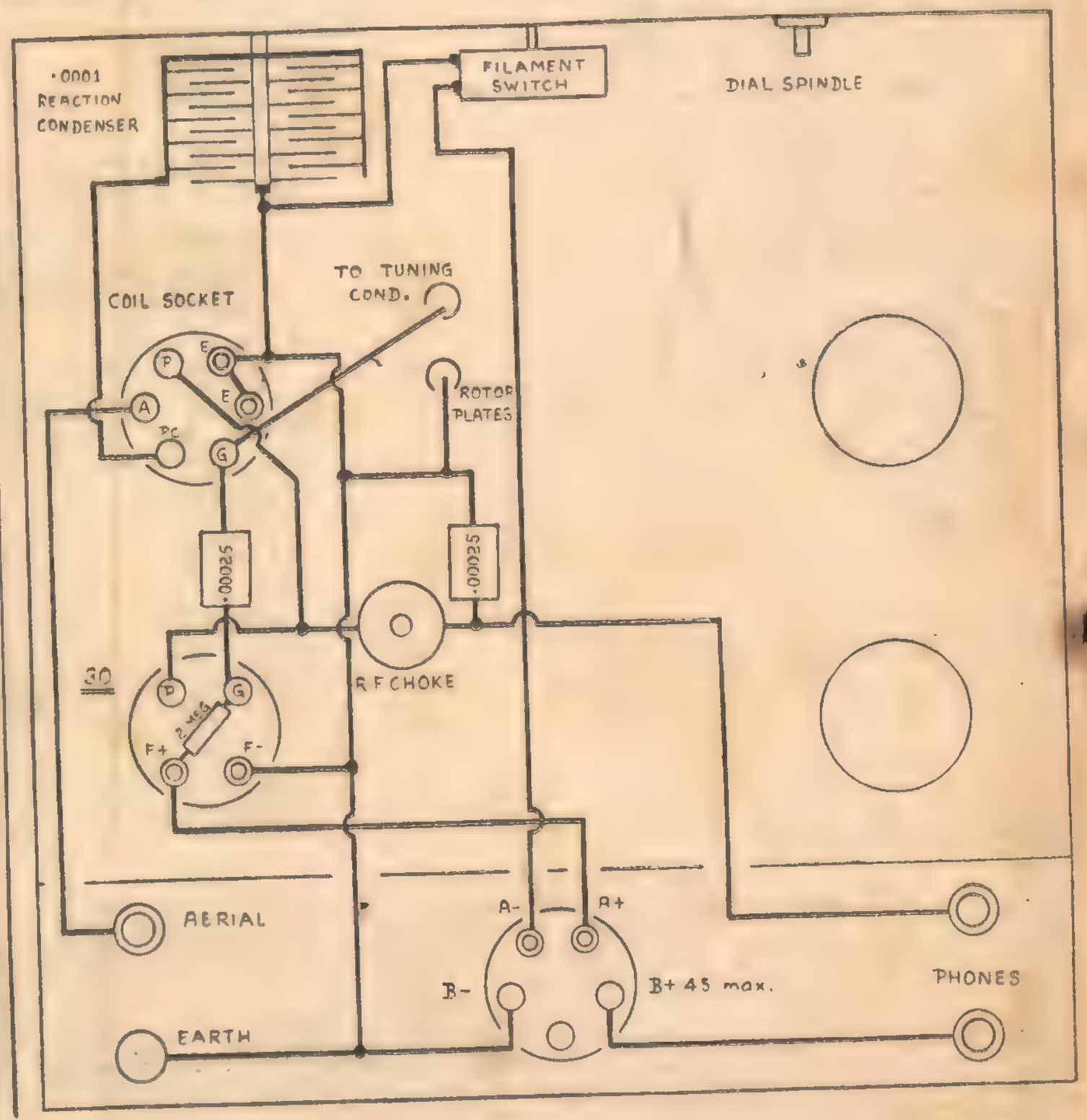
This condenser should also have a smooth movement without jumpiness or backlash and without being actually sloppy. It may be controlled by an ordinary knob.

The off-on switch is a simple affair which may take a variety of forms. All it has to do is to make and break the filament circuit in a definite fashion. The breaking of the filament circuit is sufficient in this receiver to cut off all current drain from the batteries.

TUNING COILS

The heart of the set is the tuning coil, for on the correct adjustment of the coil depends the whole performance of the receiver.

Suitable tuning coils, usually known as "Reinartz" coils, are available as standard components, mounted in metal



shield cans. However, as far as we know, broadcast coils are the only ones obtainable.

If you decide to use a factory wound coil, there will be no need for a coil socket. The whole assembly will be mounted directly on to the chassis and permanently wired up. You will probably be able to obtain instructions for wiring up the particular coil you buy. If it is equipped with a metal shield can, the latter will have to be connected to the earth terminal.

For those who want to wind their own coils—and this is good experience—full instructions are given on the page of coil data at the end of this article. All coils are wound on 1¼in. diameter ribbed plug-in formers, which are more or less standard.

SIX-PIN FORMERS

When we went to buy the formers the only ones available were the 6-pin variety, so that a 6-pin socket was installed to take them. There are actually five connections to be made, and 5-pin formers would serve the purpose. You will note that the earth connection is common to two windings.

The method of bringing out the leads to the pins does not matter a great deal, the main thing being to see that each of the windings is ultimately connected in the correct manner. Naturally, if a set of coils is made up to cover several bands, the connections have all to be the same.

The coil connections beneath the chassis are clear from the underneath wiring diagram. You should be able to manage the wiring of the coil after studying a little diagram on the coil data page. It may have you rather puzzled at first, but don't mind that. It often does one good to puzzle out these tricky little points.

Begin by winding on the turns nearest the base of the coil and work towards the top, spacing out the windings according to the instructions.

The ends of the windings may be anchored by drilling small holes through the former with a nail, or, more simply, by sealing them down with a drop of wax or a blob of shellac applied with a heated soldering iron.

FINISHING THE COIL

Take care to see that all the windings are wound in the same direction and that there are no crossed or shorted turns.

When the windings are complete, clean the end of the protruding wires carefully with sand or emery paper and push them down the respective pins in the base. Apply a little soldering flux to the tip of the pin only, and then solder.

If this is done very carefully, you can keep the solder off the sides of the pins and cause it to run down inside the pins a little way, thus making thorough contact with the wire. Finally, trim off the excess wire and clean up the ends of the pins so that they fit properly into the coil socket.

You will find that, after a while, you will get the knack of winding coils and will be able to make quite a neat job

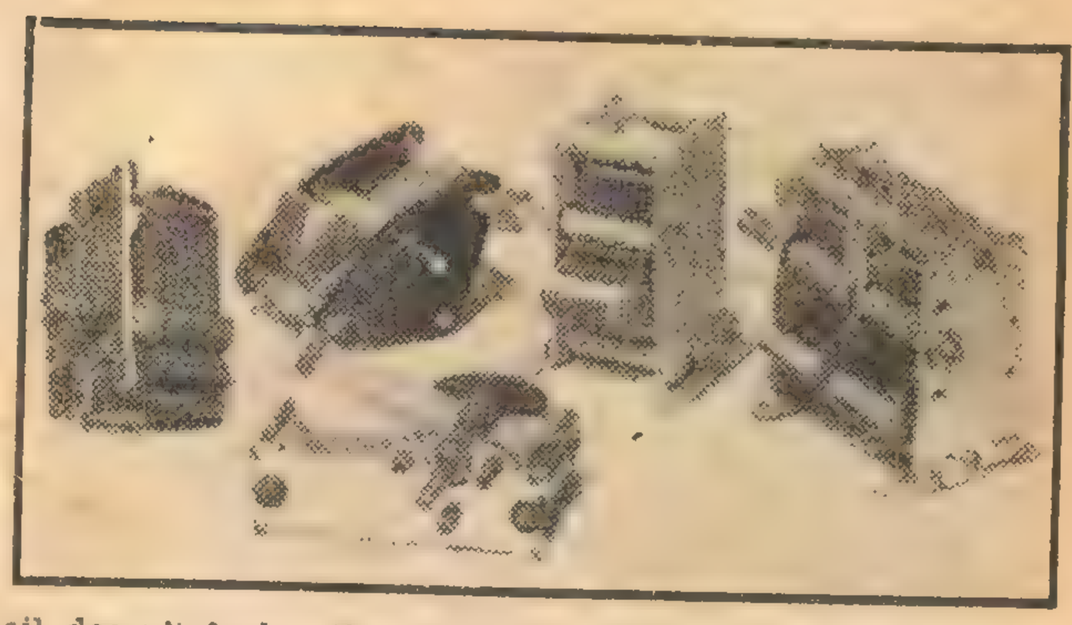


Figure 5.—A representative group of tuning condensers. The two on the extreme right are modern types. At the rear are two old-timers, which may or may not be serviceable. In the foreground is on old but very good condenser, which would be entirely satisfactory.

of them. If your first coil doesn't look so hot, strip it down and rewind it.

You will note that, in the coil data, no exact figures are given for the number of turns on the reaction winding. We suggest that, for a start, you wind on the full number of turns. It is much easier to strip off a few excess turns than to add extra turns.

Leaving the coil for the time being, we can next discuss the valve. The valve specified and used for most of the tests was a type 30. We also tried a type B217, which happened to be in the socket when the photographs of the receiver were taken.

Actually, almost any of the numerous general-purpose triodes could be used and it is rather out of the question for us to mentian them all. Nearly all enthusiasts will have a triode of some description available, and you will need to arrange matters to suit it.

The most important matter is that of the filament voltage and current. If not known already, the information can be obtained from valve data

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CONSTRUCTION

UNDERNEATH VIEW OF CHASSIS

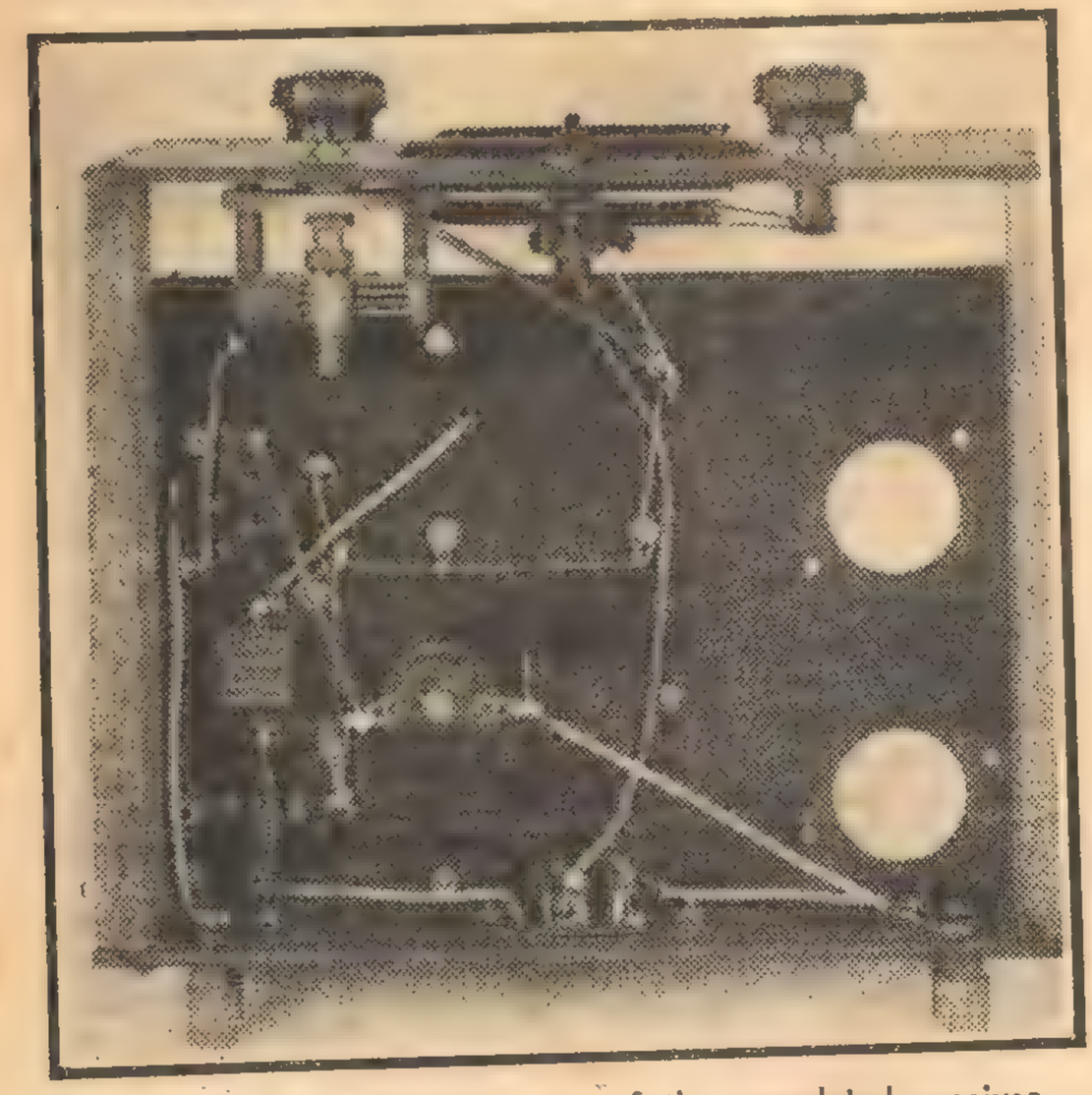


Figure 6.—An underneath view of the completed receiver. Note that all the leads are taken direct from point to point to ensure efficient operation. The position of the r-f choke and of the two mica condensers is clear. The grid leak is a half-watt type, connected across the pins of the valve socket.

charts. A valve should be supplied with its correct filament voltage for best results. The voltage can sometimes be on the low side, but it should never be higher than the rated figure.

The most satisfactory source of filament voltage is probably an accumulator supplying either 2, 4 or 6 volts, according to requirements. If the current drain of the valve is light—say, 0.1 amp or less—it may often be supplied by one or more 1.5 volt dry cells.

In the case of the 30 and other 2 volt filament types, a 2.0 volt accumulator is recommended, although satisfactory operation may sometimes be had with a single 1.5 volt dry cell supplying the filament.

For the B battery voltage, a single 45 volt light duty battery is ample for all types. In fact, most valves will operate quite well with from 18 to 22.5 volts on the plate. With a single valve set, it is as well to limit the B battery voltage to 45, out of respect for the battery, phones and valve.

VALVE CHARACTERISTICS

The characteristics of the valve itself have quite a lot to do with the operation of the receiver. This is particularly true of the reaction. Some valves will be found to need more turns on the reaction winding than others—hence the lack of a definite figure for the reaction winding in the coil data.

In our little set, using a type 30 valve and 22.5 volts on the plate, the number of reaction turns on the respective bands were 80, 30, 18 and 8. It should be mentioned that the valve appeared to need the full 45 volts on the plate for the 10 to 33 metre band.

As far as the ultimate details are concerned, it is largely a matter of trial and error to get things just right for your particular valve. The general procedure for experimenting is indicated in the page of coil data.

For the rest, the other components are minor items, which scarcely warrant special mention. From the photographs and the underneath wiring diagram, you will see where they all fit in.

The wiring of the receiver should not present any difficulty, once you have got over the hurdle of winding the coils.

We suggest you begin by putting in all the earth leads, making sure that you earth the rotor plates of the two variable condensers. Then the other leads can be added one by one.

As always, use the flux sparingly, so that it does not run down into the components or form a film over the joint. Use just enough solder to make a neat, round blob over the wires Too much solder is as bad as too little.

BATTERY SOCKET

Keep your soldering iron clean and sufficiently hot so that it will cause the solder to flow freely. If the iron is too hot or too cold, it will not solder properly, if at all.

Be very careful how you wire up the battery socket, as a short circuit here can do a lot of damage. When you come to make up the battery plug, identify the various pins by looking on to the pins and not on to the back of the socket.

Mark the individual leads carefully and, before you twist them together, trace them through to see that they all go where they should. You will need to be careful, in the wiring of the plug, to avoid the possibility of the wires shorting.

When the receiver is complete, check over the leads carefully and then connect up the A battery. A torch globe on a couple of leads will indicate whether the A battery voltage is present across the filament pins with the switch in the "on" position.

Next connect up the "B" battery and earphones and see that it does not affect the light of the torch globe. If something is wrong, it is far better to discover it with the aid of a torch globe than by burning out the valve.

OPERATING HINTS

If all is in order, plug the valve in, connect up the aerial and earth and listen in the phones for signals. If you can only hear a lot of whistles as the dial is rotated, turn the reaction condenser plates further out of mesh until the whistling stops.

You will find that there is a critical setting of the reaction condenser, just before the point of oscillation, where the signals are strongest. Note that the receiver should never be operated in a state of oscillation, as it will radiate and will draw upon you the wrath and ire of your neighbors.

You may possibly find that alterations to the coil are necessary to achieve proper results. Read carefully through the page of coil data to get the general idea.

With a little receiver of this type, everything depends on adjusting it so that it is operating at the peak of efficiency. If you find that modifications are necessary, don't be discouraged. The very experimenting will be good fun, if approached in the right attitude, and will also serve to teach you valuable lessons about your new hobby.

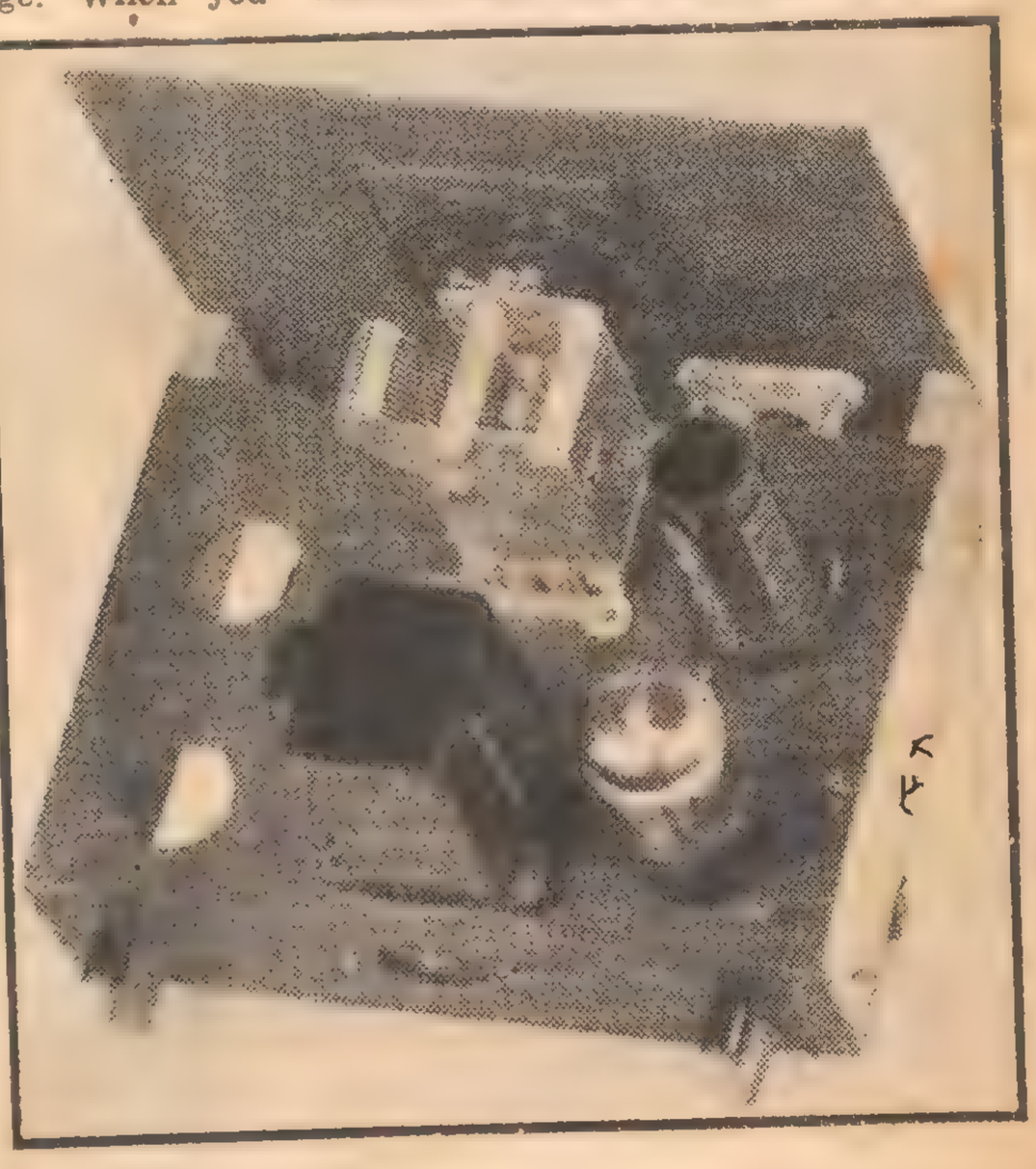


Figure 7.—A rear view of the chassis, showing clearly the layout of the major components. Note the two unused valve holes. When this picture was taken the audio transformer was in place, preparatory to conversion to a two-valve set. It is, of course, not required for the single-valve receiver.

COIL DETAILS FOR SMALL RECEIVERS

In our query service we are constantly receiving requests for coil data for one, two and three valve receivers. Many simply ask for details of coils to cover the broadcast band and a single shortwave band. However, of late, an increasing number are asking for details of coils to cover the intervening bands. In view of this, we anticipate that this self-contained page of coil data will prove most useful.

CONSIDERING the dozens of different detector valves, the variety of tuning condensers and coil formers and the variety of wire gauges and insulation, we can scarcely be expected to supply exact specifications to meet all possible combinations of components. Nevertheless, we want to be as helpful as we can.

The best we can hope to do, therefore, is to give approximate coil data to act as a guide, leaving it to individual experimenters to make the final adjustments. After all, half the fun is in getting the completed receiver to behave as we want it to do.

MAKING ADJUSTMENTS

Thus, if a receiver proves in practice to be too unselective, try the effect of reducing the number of turns on the primary winding and/or increasing the spacing between primary and secondary. This improves the selectivity at the expense of the gain. Increasing the number of turns and/or the coupling has the opposite effect.

If a receiver misses out on the high frequency end of the band, reduce the number of turns on the secondary. If it fails to cover the low frequency end of the band, increase the number of turns on the secondary.

With regard to the reaction winding: If the receiver fails to oscillate towards the low frequency end of the band, it may be necessary to increase the number of turns on the reaction winding and/or to move it closer to the secondary. If the reaction cannot be controlled properly, it may be necessary to remove turns and/or move the winding away from the secondary. If the reaction does not work at all, try reversing the connections to the reaction winding.

AERIAL COILS

BAND.	PRIMARY.	SECONDARY.	REACTION (if any).
Broadcast Band.	15 t. 32 g. enam. spaced ⅛in. from earthed end of secondary.	110 t. 32 g. enam. close wound.	40-80 t. 40 g. enam. spaced ⅛in. from grid end of secondary.
70 to 220 metres. 4.3 to 1.3 mc/s.	11 t. 32 g. enam. spaced ⅛in. from earthed end of secondary.	38 t. 24 g. enam. close wound.	20-40 t. 32 g. enam. spaced ⅛in. from grid end of secondary.
30 to 90 metres. 10 to 3.3 mc/s.	7 t. 32 g. enam. spaced 3-16in. from earthed end of secondary.	14 t. 24 g. enam. spaced to occupy ½in.	10-20 t. 32 g. enam. spaced ⅛in. from grid end of secondary.
10 to 33 metres. 30 to 9 mc/s.	2 t. 32 g. enam. inter wound from earthed end of secondary.	5 t. 24 g. enam. spaced to occupy ½in.	5-8 t. 32 g. enam. spaced ⅛in. from grid end of secondary.

R. F. COILS

Specifications for the r-f coils are identical to those for the aerial coils, except for the primary windings. The number of primary turns for the respective bands are as follows: Broadcast band, 25 turns; 70-220 metre band, 15 turns; 30-90 metre band, 10 turns; 10 to 33 metre band, 4 turns. In the case of receivers with an r-f stage, the reaction winding is wound on to the r-f coil instead of the aerial coil.

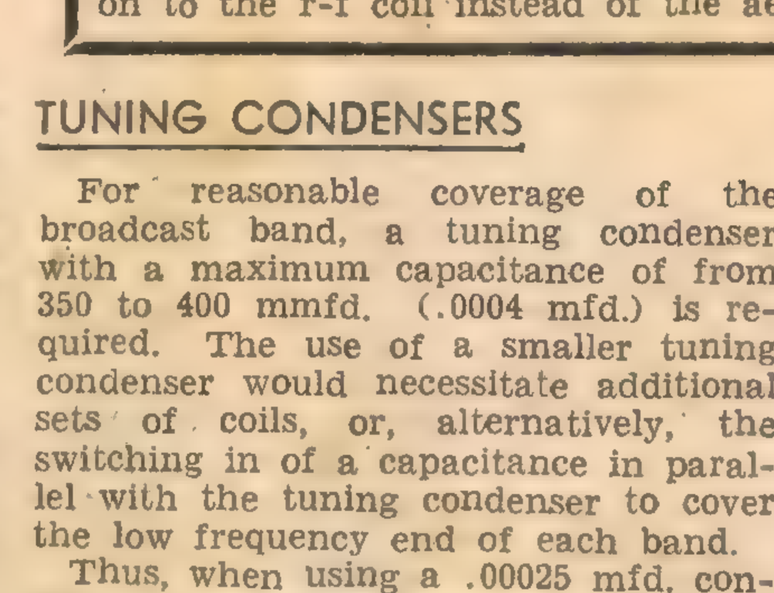
TUNING CONDENSERS

For reasonable coverage of the broadcast band, a tuning condenser with a maximum capacitance of from 350 to 400 mmfd. (.0004 mfd.) is required. The use of a smaller tuning condenser would necessitate additional sets of coils, or, alternatively, the switching in of a capacitance in parallel with the tuning condenser to cover the low frequency end of each band.

Thus, when using a .00025 mfd. condenser, the high frequency portion of each band may be covered in the normal manner. To cover the low frequency portion, switch a mica condenser of .0001 or .00015 mfd. directly in parallel with the tuning condenser.

The above coil details are on the assumption that the tuning condenser has a maximum capacitance in the vicinity of 400 mmfd. The overlap is sufficient to allow for considerable variation in maximum and minimum capacitance.

All coils are wound on 1¾in. diameter formers, which is the most usual size for plug-in coils. For the sake of economy, only three popular B and S gauge enamelled wires are specified. Wires of slightly different gauge and/or with different insulation could be used, but due allowance would have to be made for the different space occupied by the coils, and the resultant effect upon the inductance.



CONNECTIONS &c.

Unless otherwise stated, all coils are normally wound in the same direction. The normal connections are as follows: Top of reaction winding to the "earthy" side of the circuit, bottom towards the plate; top of the secondary winding towards the grid, bottom to earth; top of the primary winding to the aerial or to plate, as the case may be, bottom to earth or to B plus.

In the case of receivers without an r-f stage, the coils will be exactly as under the heading "AERIAL COILS." No r-f coil is used.

In the case of receivers with an r-f stage, the Aerial Coil has a primary and secondary winding only. The reaction winding is added, instead, to the R-F Coil, so that the R-F Coil has a primary winding as specified, a secondary winding, and a reaction winding.

ADDING AN AUDIO STAGE TO YOUR SET

Although one can have quite a lot of fun with a conventional single valve set, there inevitably comes the time when one desires a receiver with a little more "kick" — a receiver which will bring in those signals too weak to be heard properly on the little one-valver.

IN adding another stage to a receiver there are two possibilities: One is to amplify the signals before they reach the detector—this is known as radio-frequency or r-f amplification; the other possibility is to amplify the signals after the detector — audio frequency, or a-f amplification.

Either method has the desired effect of boosting weak signals. To include an r-f stage it is necessary to add another coil and tuning condenser. This, of course, means another control to be manipulated, unless one is able to provide ganged tuning condeners and to see that the tuned circuits "track" properly.

On the other hand, the addition of an audio stage does not complicate the control of the receiver, although it provides considerable amplification. Therefore, the obvious step, when adding to a one-valve receiver is to provide additional audio-frequency amplification.

A WORD OF CAUTION

Here, we must add a word in season. There is a practical limit to the amount of audio amplification following the detector. Too much amplification is likely to result in troubles with instability, microphony and hum.

Generally speaking, the practical limit is reached by two low gain stages after the detector or a single high gain stage. Any further addition to the receiver should preferably take the form of a stage of r-f amplification.

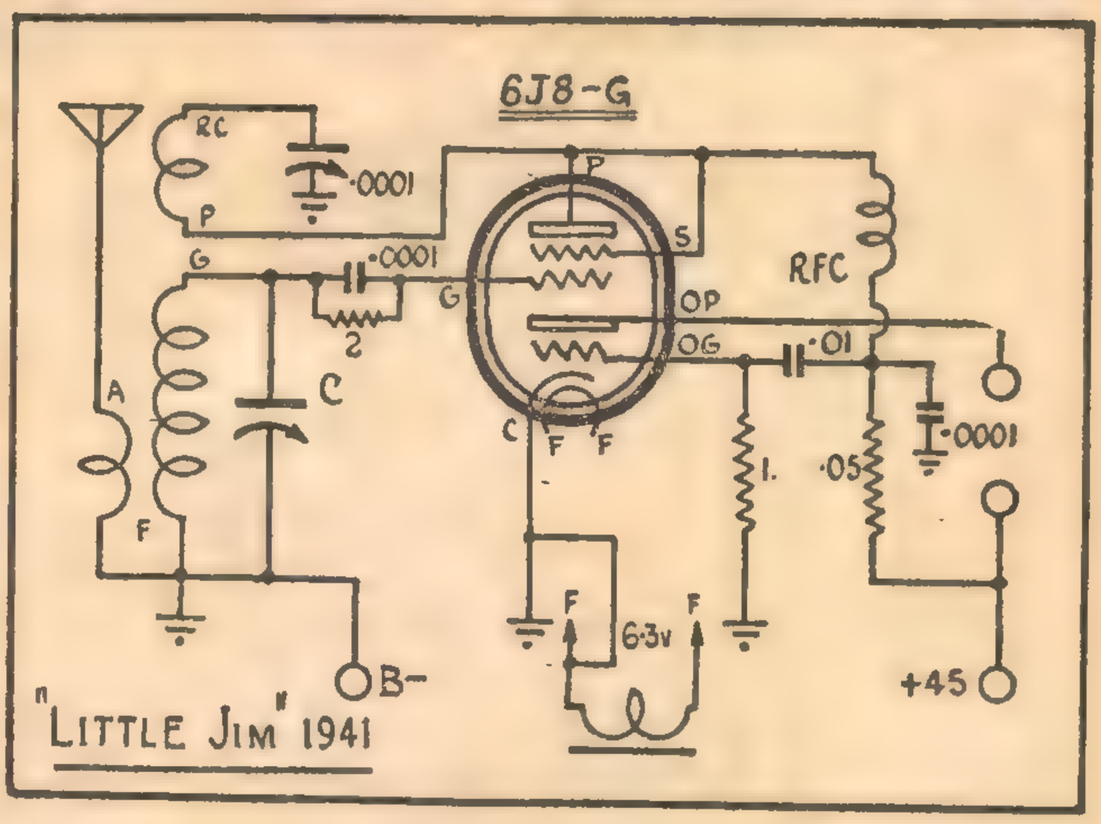
Unfortunately, lack of space does not permit us to discuss in detail these considerations, but there are the bare facts for your guidance. Now, let us pass on to the subject of receivers incorporating a stage of audio frequency amplification in addition to the detector.

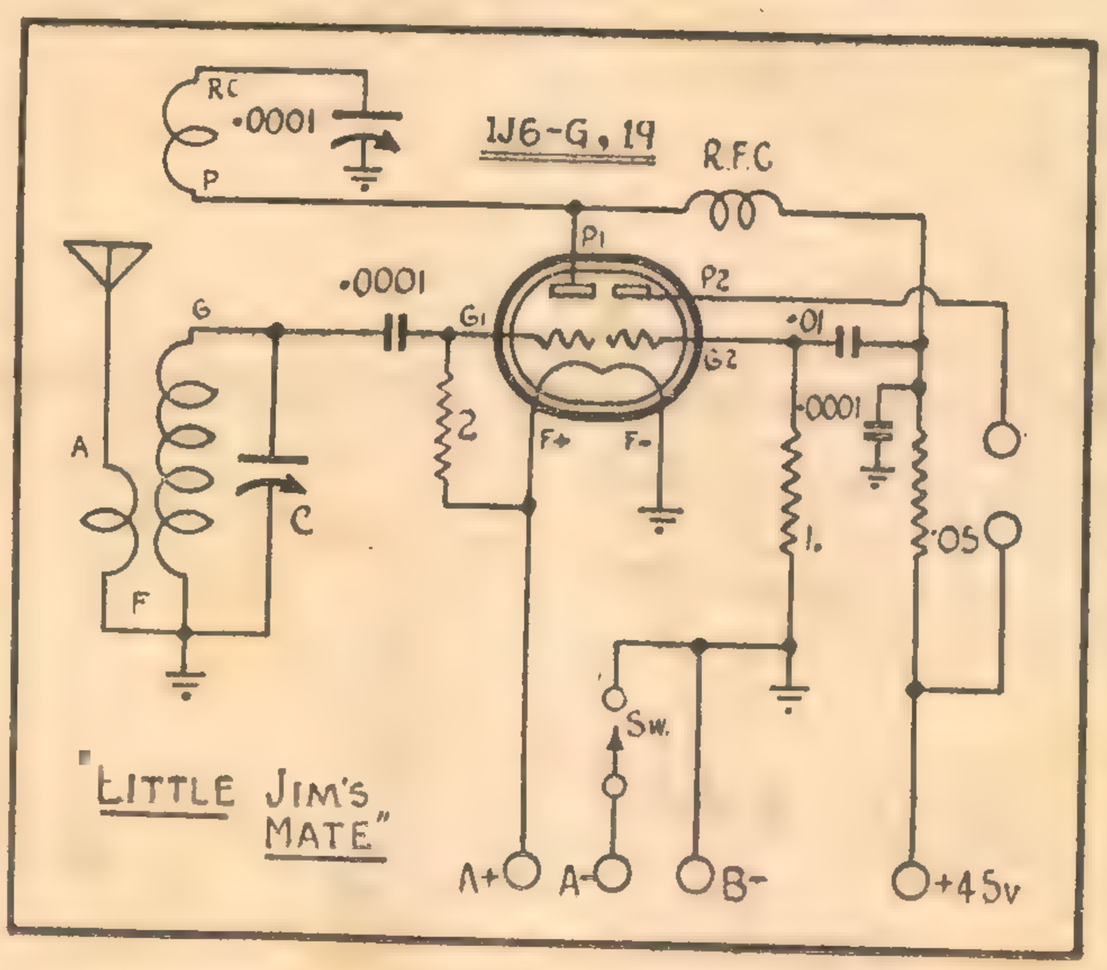
From time to time a number of valve types have been released incorporating in the one envelope a multiple electrode structure, which is the equivalent of two separate valves. Although, perhaps, not designed with the purpose in view, such valves may often be utilised in two-stage receivers, one set of electrodes serving as the detector, the other set for the purpose of r-f or a-f amplification.

The obvious advantages are a saving in first cost and a reduction in overall dimensions, if that is a consideration. Of course, if you happen to have on hand two ordinary valves, it would be a lot cheaper to use them than to buy a new multiple type. Figures 1, 2 and 3 show three very popular small sets

(Continued on Next Page)

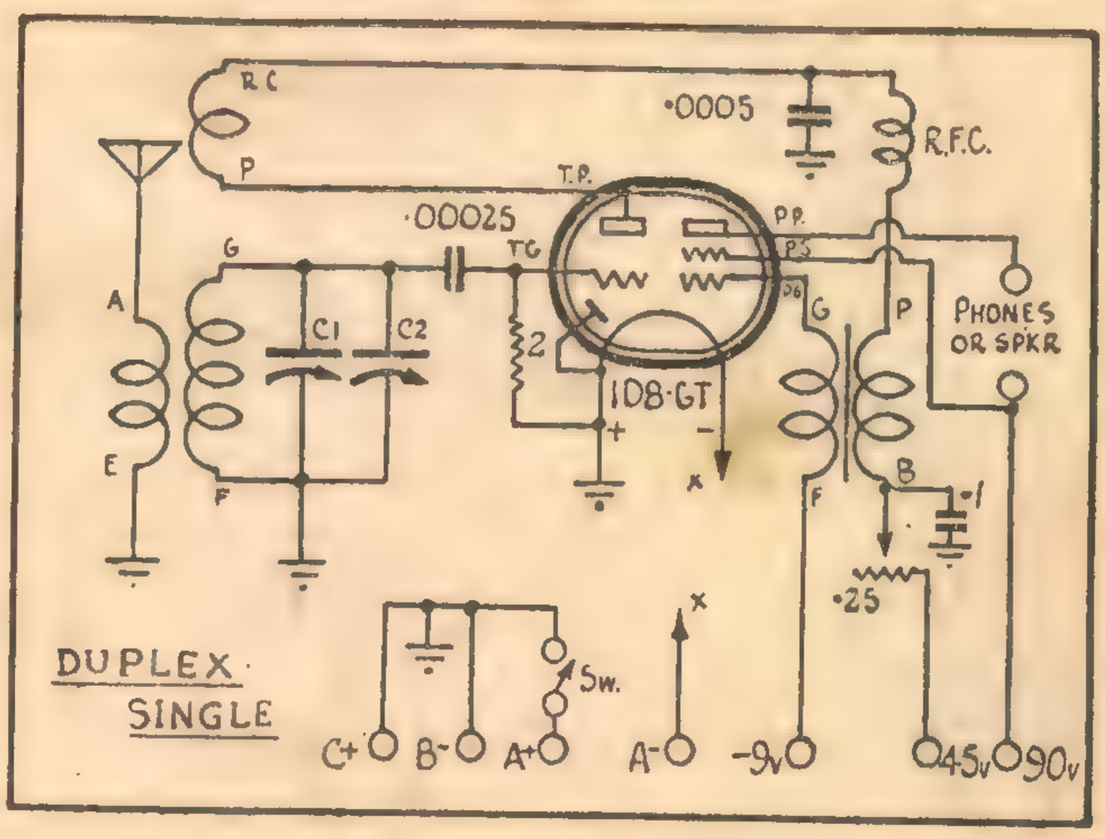
Here is the schematic circuit of the "Little Jim" receiver. It makes use of the 6J8-G converter valve and employs resistance coupling between the detector and audio amplifier. The heater voltage is best supplied by a small 6.3 volt filament transformer, operating from the mains. "Little Jim" was described in Radio and Hobbies for February, 1941. The issue is now out of print but a copy of the underneath wiring diagram may be obtained through our shilling query service.



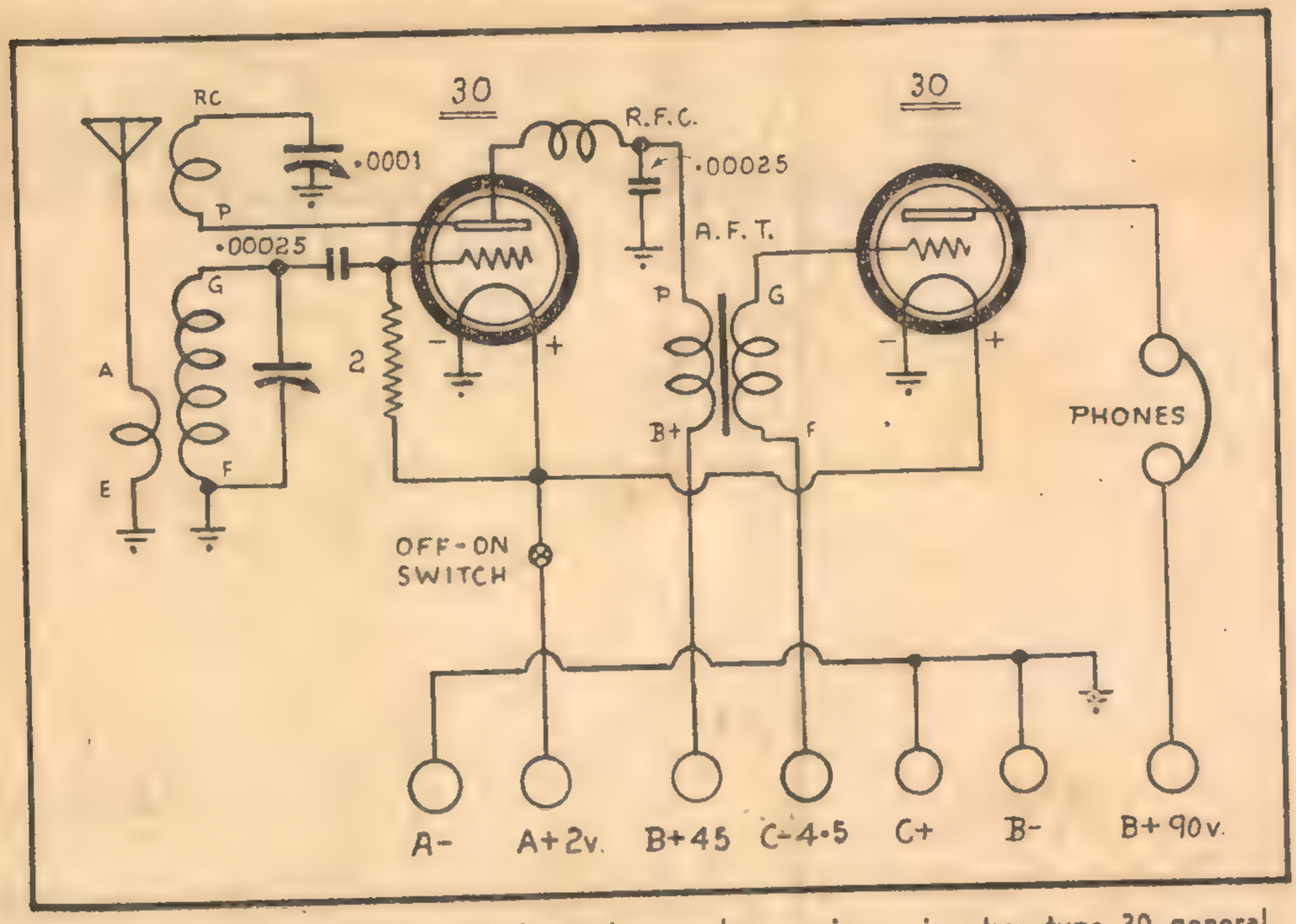


The "Little Jim's Mate" receiver uses the 1J6-G or, alternatively, the 19 valve and may be operated entirely from batteries. It utilises resistance coupling between the detector and audio amplifier although transformer coupling could be substituted, if desired, with some increase in gain. "Little Jim's Mate" was described in Radio and Hobbies for March, 1941. This issue is out of print but copies of the underneath wiring diagram may be obtained through out shilling query service.

The "Duplex Single" is a very efficient little receiver built up around the 1D8-GT multiple valve. It requires a 1.4 volt A battery, a 90 volt B battery supply and a 9.0 volt C battery. The Christmas 1939-40 issue of Radio and Hobbies, in which this receiver was originally described, is now out of print. As in the case of the receivers above, copies of the underneath wiring diagram may be obtained through out shilling query service.



CONSTRUCTION



The circuit diagram of a straightforward two-valve receiver using two type 30 general purpose triodes. The detector circuit is the same as that of the one valve receiver, the audio amplifier being additional. The off-on switch is wired in an alternative manner, permitting a common earth connection for A, B and C plus, and allowing the use of a five-pin battery plug.

built up around valves having a multiple electrode structure.

All these receivers have been featured at one time or another in "Radio and Hobbies," and hundreds of them have been built by our readers. Unfortunately, space only permits the inclusion of the schematic circuits, but this will be sufficient data for many readers to go ahead and build them.

If you are fortunate enough to have the original issue in which each one was described, you can study the full instructions.

The "Little Jim" circuit uses a type 6J8-G valve, which is usually employed as the frequency changer in modern superhets. It is intended for use where a-c mains are available, and utilises a small filament transformer to supply the heater.

The plate supply is derived from a single 45 volt B battery. A light duty battery is all that is required, and even that should last for quite a long time. If you happen to have available an old "B" eliminator, this could be used for the plate supply, instead of the 45 volt battery specified.

"Little Jim's Mate" is a similar two-in-one receiver intended for all-battery operation. It uses a 1J6-G, or a type 19, which are twin-triode types. For the filament it requires a 2.0 volt accumulator, although a single 1.5 voit cell may be made to give reasonable results. For the high tension supply a single 45 volt B battery is required.

METHOD OF COUPLING

Both receivers utilise resistance coupling between the detector and the audio amplifier stage. This is entirely suitable in the case of "Little Jim" since the detector is a pentode.

In the case of "Little Jim's Mate," transformer coupling could be used in place of resistance coupling. The change would result in increased gain, although it would add to the bulk and to the initial cost of the receiver.

The third receiver of the group is the "Duplex-Single," a very efficient little job, using the comparatively modern type 1D8-GT. It requires a 1.5 volt A battery for the filament, two 45 volt B batteries for the high tension, and a 9.0 volt C bias battery. On strong stations it would work a small speaker.

These three receivers are all very well if you can manage to get the necessary valves, but many will have on hand two or more ordinary valves which they will want to use. Two typical two-valve circuits are given on these pages.

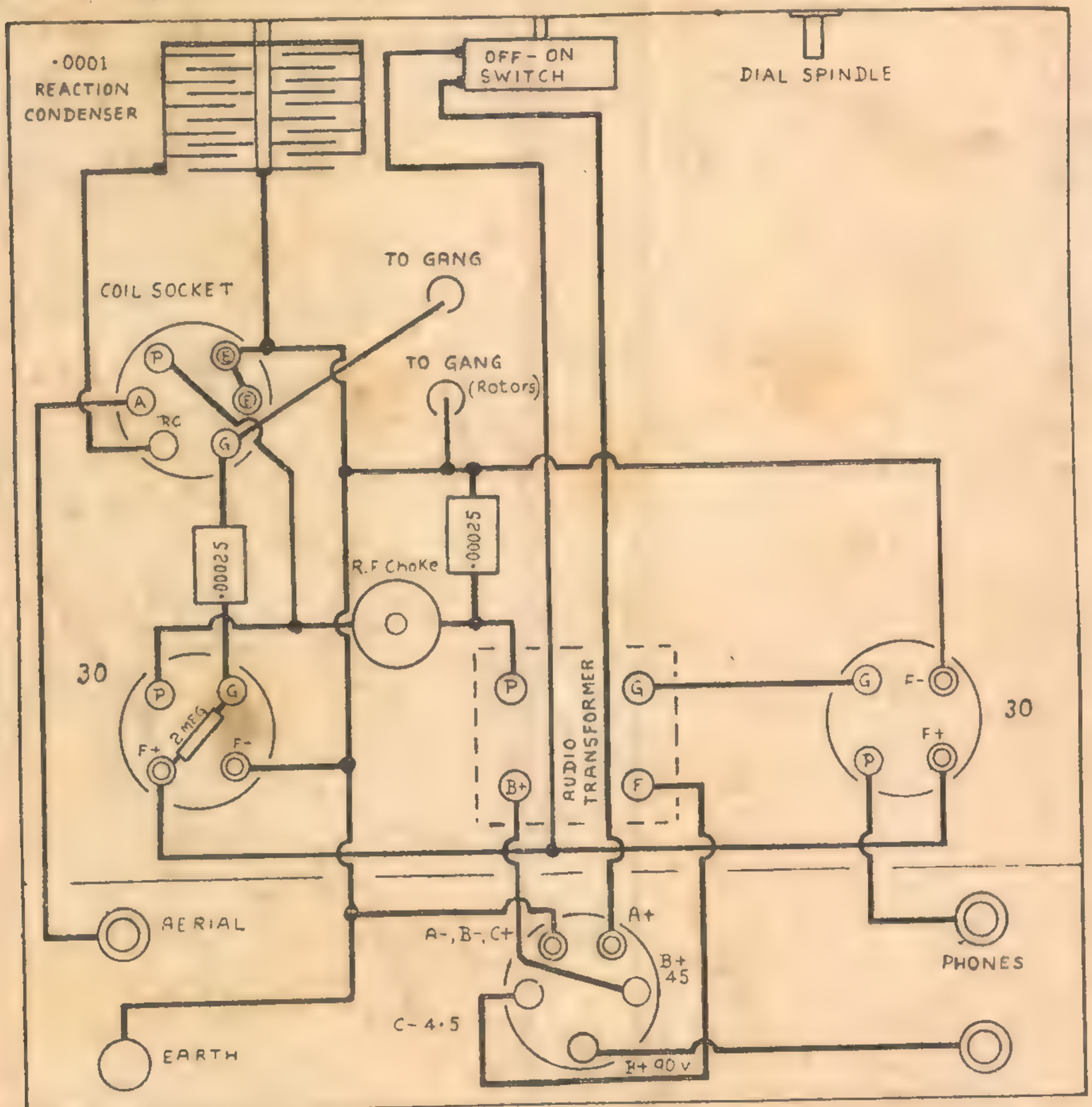
TWO-VALVE RECEIVERS

The first of these uses two type 30 valves in a perfectly conventional circuit. Actually, the first portion of the circuit is the same as that of the one-valve receiver described in the previous article.

If you built up the one-valver it is simply a matter of adding the additional components, and of modifying the battery plug and socket to accommodate the additional connections.

The plate current of the detector, instead of flowing through the phones, flows through the primary winding of an interstage audio transformer. The audio voltages developed across it are stepped up, according to the turns ratio of the transformer, and are applied to the grid of the second valve.

The signals are duly amplified by the second valve and then actuate the phones. A little receiver of this type,



The underneath wiring diagram of the above two valve receiver. Note that, when making up the battery plug, three separate connections go to one of the filament pins, as marked. The connections are those to A-, B- and C plus.

using two general purpose triodes, is not very satisfactory with a speaker and does much better as a headphone receiver.

NEGATIVE GRID BIAS

One point worthy of special mention is the use of a bias voltage in the grid circuit of the audio amplifier. The effects of applying the bias voltage are to reduce the plate current and to improve the tonal qualities of the receiver.

The precise amount of bias required for any audio amplifier varies with the type of valve concerned and the applied plate voltage. In the case of type 30, operating with 90 volts on the plate, the optimum bias voltage is —4.5 volts. If you only use a single 45 volt B battery to supply the high tension voltage, the grid bias would need to be reduced to about —1.5 volts.

The use of the full 90 volts on the plate of the audio amplifier helps to increase somewhat both the gain and the power output. However, it is not at all necessary for purely headphone reception and the whole set can be operated from a single 45-volt battery.

EXTRA BATTERY LEADS

You will note that we have added three extra leads to the battery plug to carry the high tension and bias voltage for the audio amplifier. Even if you decide to use only 45 volts on the audio amplifier, it is as well to retain the independent B plus leads, to permit individual adjustment of the plate voltage of the detector.

As mentioned in connection with the one-valve receiver, the plate voltage of the detector should preferably be limited to 45 volts.

Our original version of this receiver was built up on the same masonite chassis as used for the one valve receiver. In fact, having completed and tested the one-valver, we simply went ahead and added the extra stage.

The underneath wiring diagram accompanying the circuit shows clearly the layout of the various components and the connections thereto. As regards the tuning coils and condensers, and the matter of adjustments, the remarks in regard to the one-valve receiver apply in full.

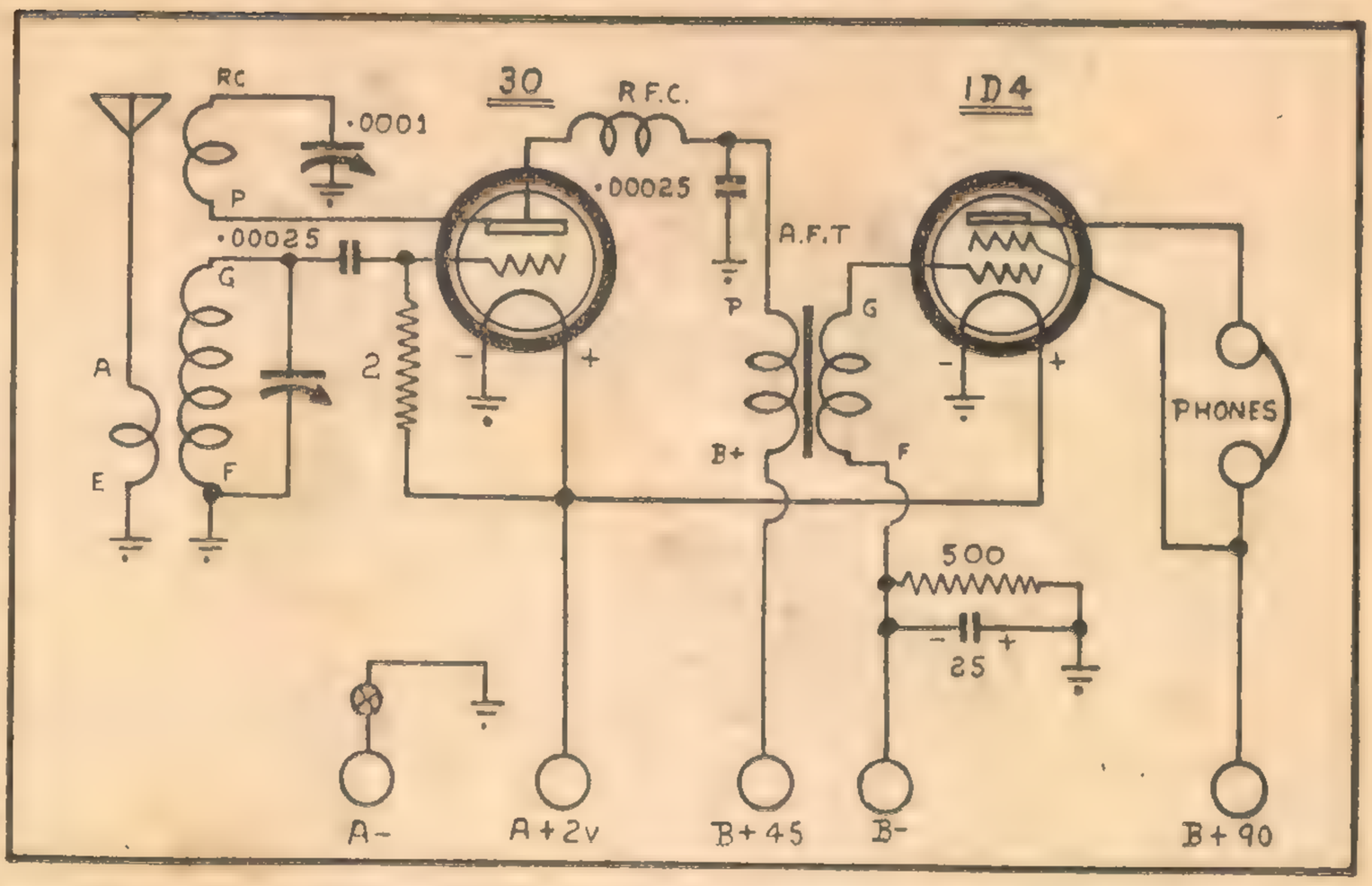
A photograph showing the layout of a two-valve receiver on the masonite chassis appears on page 56. The tuning condenser and coil are just behind the panel; the detector is in the foreground to the right, and the audio transformer in the centre and the audio amplifier to the left.

OTHER VALVE TYPES

This receiver could be built up using other general purpose triodes. The circuit generally would remain the same, but you would have to check up on the following points: (1) The base connections of the valves used; (2) the filament voltage required; and (3) the bias required by the audio amplifier at the particular B battery voltage used.

It is also as well to check up on the filament current of the valves you propose to use. Some of the older types were very greedy in this respect. Type 30 valves only draw .06 amp at 2.0 volts.

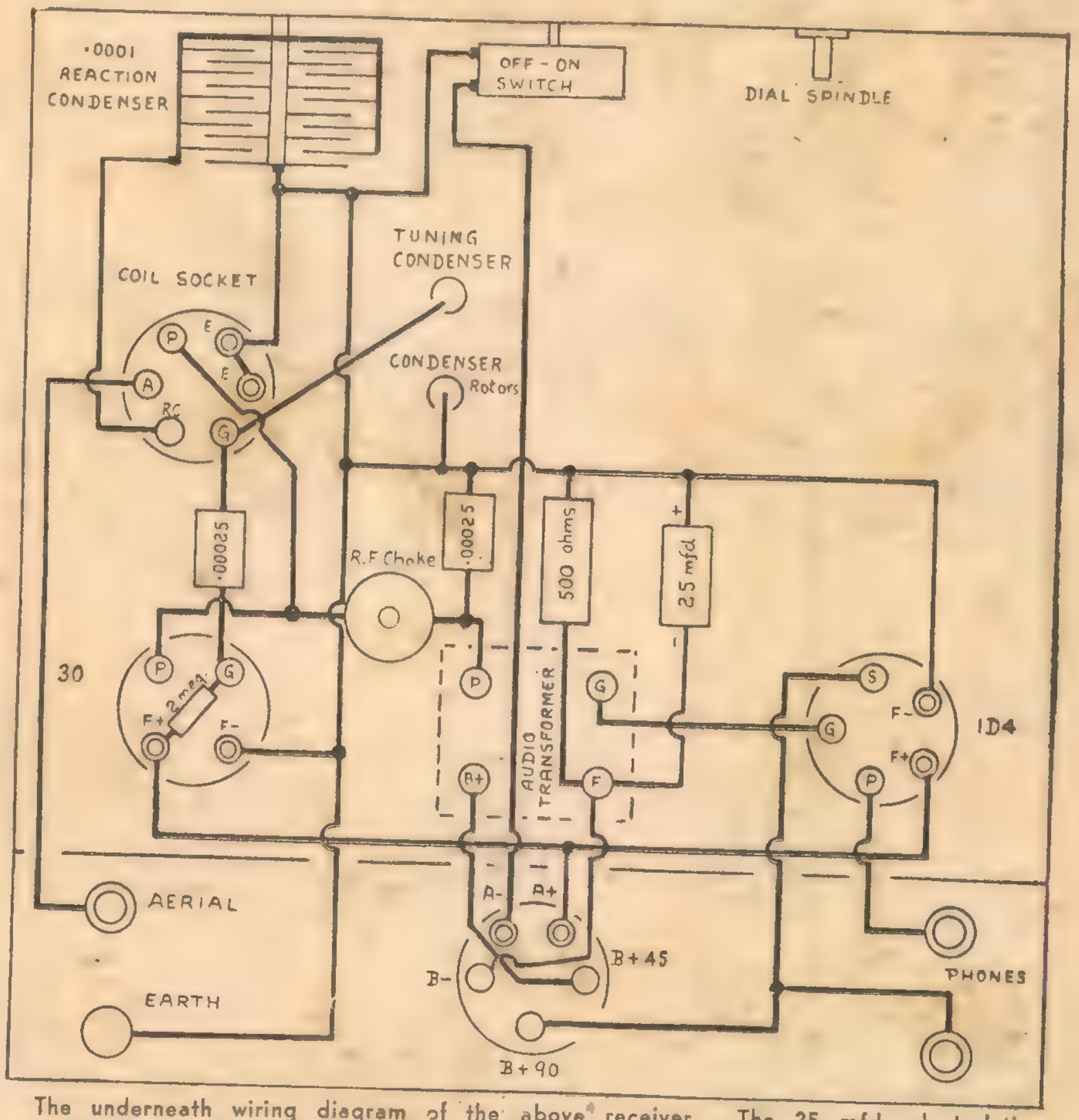
An alternative two valve circuit using a type 30 as the detector and a 1D4 as the audio amplifier. The octal-based equivalents of these types are respectively the 1H4-G and the 1L5-G. Note the system of back-bias for the audio amplifier.



ALTERNATIVE CIRCUIT

An alternative two-valve receiver circuit is also shown. In this case, the output valve, instead of being a general purpose triode, is a modern battery output pentode. The output from this valve on a strong station would be sufficient to operate a small loud speaker. However, the receiver would be perfectly satisfactory with headphones.

(Continued on Page 56)



The underneath wiring diagram of the above receiver. The 25 mfd. electrolytic condenser in parallel with the bias resistor is not essential to the operation of the receiver, although it should preferably be included. Note that it must be connected into the circuit the right way round.

WORK OUT YOUR OWN MATHS PROBLEMS

In our previous article, series, parallel and series-parallel resistor networks were discussed, together with the methods of determining the total effective resistance of such circuits. As these networks are usually to be found, in some form or other, in practically every type of receiver, we propose to follow on from this point and consider typical applications.

IN the design of receivers and amplifiers, we frequently find it desirable to arrange for a certain amount of additional current drain, over and above that normally drawn by the valves.

For example, we may wish to increase the current drain through a loudspeaker field, for the double purpose of reducing the voltage at the low potential end and of increasing the excitation. Again, extra drain is often introduced to stabilise the bias voltage across a back-bias resistor.

Still another common reason is to keep the high-tension voltage down during the warming-up period, thereby protecting the filter and bypass condensers.

Resistors introduced into a circuit simply to pass additional current are commonly called "bleed" or "bleeder" resistors. As we shall see presently, a tapped resistor or a network of resistors is often made to serve the double purpose of passing the required "bleed" current and of providing stabilised potentials lower than the normal maximum high tension voltage.

CALCULATING RESISTOR VALUE

The calculation of the value of any bleed resistor is quite simple and only involves the use of Ohm's Law. Suppose, for example, the normal current drain of a receiver or amplifier is 65 milliamps and that we really require a total current drain of 80 milliamps. Therefore, there will be 15 mills of current remaining to be wasted or dissipated through a bleed resistor.

Assuming that the output from the power supply is 300 volts, the resistance required is found by using the basic formula R equals E/I. Remember that the current is in milliamps, so that we have to multiply in this case by 1000/1.

$$R = \frac{300}{15} \times \frac{1000}{1} = 20{,}000 \text{ ohms}$$

Now that the resistor value is known, the wattage rating can be determined, so:—

$$W = \frac{I^2 R}{1{,}000{,}000}$$

$$= \frac{15 \times 15 \times 20{,}000}{1{,}000{,}000} = 4.5 \text{ watts}$$

In normal practice it is always wise to allow up to a 100 per cent. overload safety factor for a resistor so, in this case, a 10-watt resistor would be desirable.

by C. E. Birchmeier

A voltage divider, as the name implies, is a single tapped resistor or a number of individual resistors connected across a power supply to enable lower voltages to be obtained as required. Also, being connected across the power supply, a voltage divider acts as a bleed resistor and thus serves a double purpose.

The ordinary voltage divider found in many receivers, consists of a large type of resistor with several sliding clips, which can be adjusted to give the desired intermediate voltages. No doubt the units are quite familiar to most readers.

It should be mentioned that ordinary voltage dividers are only suitable when a few milliamps are to be drawn from any particular tapping; they will not stand up to heavy current drain.

However, at the present time, due to wire shortages, conventional voltage dividers are practically unobtainable and other provisions have to be made to obtain the necessary intermediate voltages. Separate dropping resistors or, in some cases, several resistors connected in series are being used to serve the same purpose.

VOLTAGE DIVIDER DESIGN

The design of a voltage divider consisting of several resistors in series is not difficult once the order of bleed current is decided upon and the desired voltage and exact current drain from each tapping is known. After this it is just a matter of applying Ohm's Law.

Before discussing a specific case, it must be pointed out that the current flowing to earth (we use this convenient term) through the various portions of the divider network is not exactly the same.

The heaviest current flows through the first resistor, normally on the positive end of the network. Then it proceeds to divide, portion flowing to earth through the remainder of the network, the rest flowing through the external load circuit connected to the tapping. At each individual tapping, there is a further subdivision of the current.

Reference to figure 2 will make this clearer. The two resistors A and B constitute a divider network. Between the junction of the two and earth, a third resistor C is connected. The latter may be an actual resistor or the apparent resistance of the screen circuit of a valve. Following our recent discussion of series-parallel networks, it will be apparent that the current flowing through the resistor A must be greater than flowing through resistor B.

VOLTAGE DIVIDER CALCULATIONS

There are two methods of approach to voltage divider calculations. One can begin by assuming some definite value of bleed current and then proceeding to calculate the value of the individual resistance in the network.

This approach is most suitable for heavy values of bleed current, where wire wound resistors are employed and where one is able to arrange for odd resistance values, if necessary.

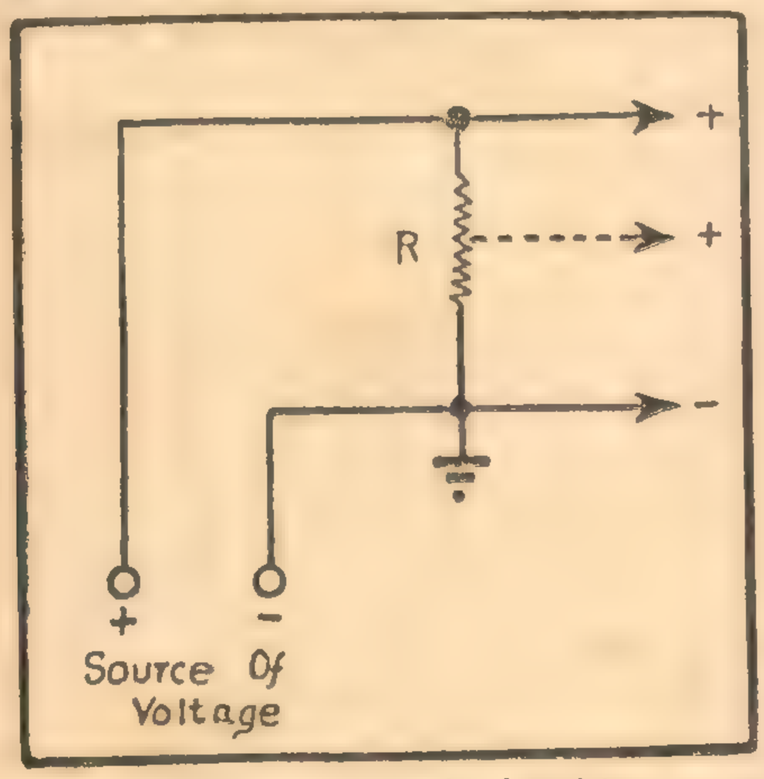


Figure 1. Showing a bleed resistor connected across a power supply. If the resistor is tapped, it may also be made to serve as a voltage divider, delivering voltages less than the maximum for the supply to the screens, etc.

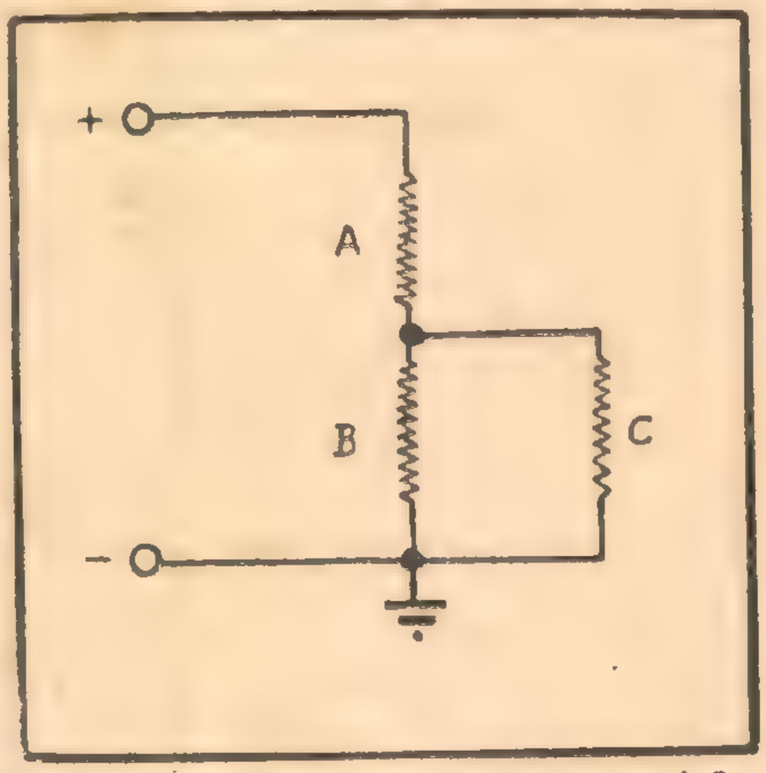


Figure 2. If the two resistors A and B together form a voltage divider, the current through A is different to that through B when any current is being drawn from the tapping. C represents the external load.

The other method of approach is to assume a convenient value for the bleed resistor at the earthed end of the network, calculating the exact total current flowing to earth from the last tapping and then working towards the high potential end in steps.

This method is most convenient for divider networks of comparatively high d-c resistance. With a certain amount of juggling, it is usually possible to obtain a suitable divider network comprising all standard resistance values.

AN EXAMPLE

Following the first approach, let us assume that we have a 250-volt power supply, which, after supplying all the needed current in the receiver, will safely allow an additional bleeder current of 15 milliamps.

Then, in addition, the following voltages are required: 100 volts at 5 milliamps, and 75 volts at 1.0 milliamps. Figure 3 will show you the voltage divider arrangement required, where it is necessary to determine the values of R1, R2 and R3, in order that the above mentioned voltages may be obtained.

Now, since the supply voltage is 250 volts and only 100 volts is required from tapping 1, there will be a voltage drop of 150 volts across R1; likewise there will be a 25 volt drop across R2.

The first step is to determine the current flow through each section of the divider. If you glance at Figure 3, you will see that the current flow through R1 must be the bleeder current—15 mills, plus the 5 milliamps for tapping 1 and 1.0 milliamps for tapping 2. Through R2 there will be the bleeder current and the 1.0 milliamp for tapping 2, totalling 16 milliamps; only the 15 mills bleeder current will flow through R3.

CALCULATIONS

Now by applying the formula R equals E/I x 1000, in which E is the voltage drop across the particular resistor and I is the respective current flow in milliamperes, we can determine the resistance of each section. Working it out, we find that R1 is 7143 ohms, R2 is 1563 ohms, and R3 is 5000 ohms.

The total resistance is, therefore, 14,706 ohms. Obviously, a standard 15,000 ohms voltage could be pressed into service in this case, with only a very slight departure from the exact calculated conditions.

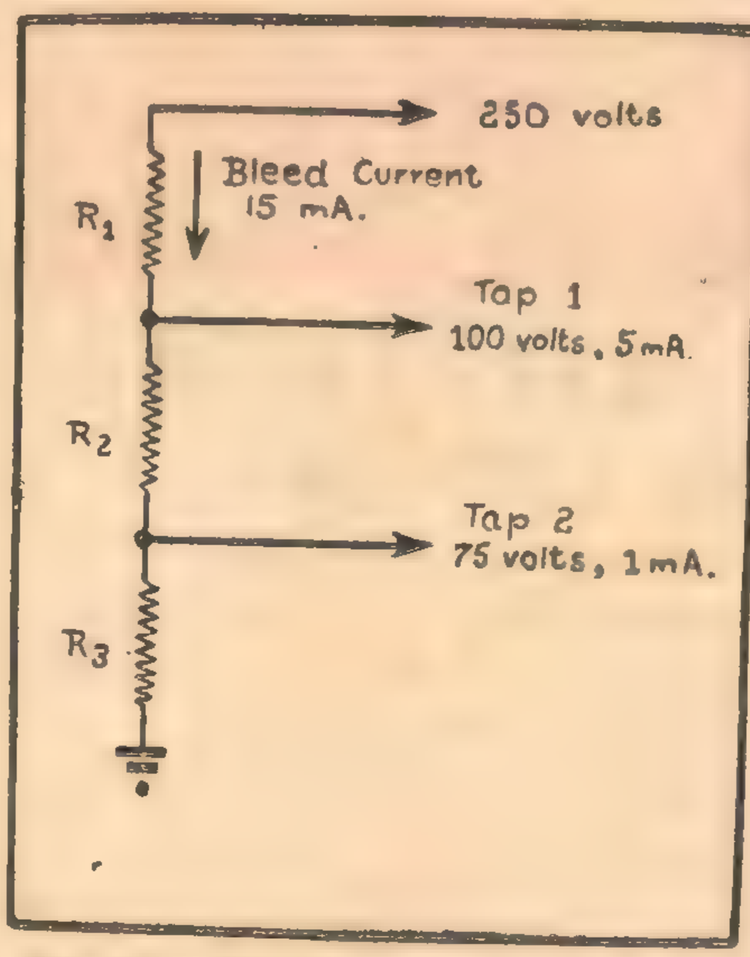


Figure 3. A typical voltage divider network. The method of calculating the resistance values is outlined in the article.

If it was desired to calculate the wattage dissipation across each section of the divider network, this could be accomplished by using one of the formulae (2), (4), or (6) in the May issue.

When using a single voltage divider unit with moveable clips, the final adjustment may be carried out with the aid of a voltmeter, when the receiver is operating. With fixed units this is not possible and slight inaccuracies may be apparent as a result of resistor value tolerances and variations between the actual and rated value of current drain for the valves. However, minor inaccuracies of this nature can usually be neglected.

AFFECTS OTHER TAPPINGS

In practice, the current drawn from the various tappings may be subject to considerable variation. For example, the screen current of r-f and i-f amplifying valves varies with the grid bias voltage applied manually or through the AVC circuit.

A variation of the current drawn from any one tapping upsets the voltages at all the other tappings on the network. This may or may not be serious. In fact, it is one of the problems which receiver designers have to face up to.

The obvious remedy lies in providing such a heavy bleed current that the current drain from each tapping is only a small proportion of the total current, and thus slight variations will not noticeably affect the other voltages. This cannot always be achieved in actual practice since the bleed current required may be excessive.

Another point to watch is that the wattage dissipation of any one section is not exceeded. To avoid this, the total current flowing through each resistor must be taken into account and care taken to select a resistor capable of carrying this current.

SCREEN SUPPLY NETWORKS

Since the ordinary type of voltage divider and similar resistors are not at present readily available, other means have to be adopted for supplying the screen voltages of the r-f and i-f amplifying valves.

As we have mentioned already, the screen current of such valves is subject to considerable variation and the use of a simple series resistor is not always satisfactory. If the resistor is adjusted to permit the correct voltage with no signal input, the chances are that the voltage will rise very much above this figure with signal.

Of course, there are special circumstances where the use of a series resistor is satisfactory. But that is a question of circuit design rather than mathematics.

TYPICAL CIRCUIT

To illustrate these points, let us consider a typical screen grid network supplying two 6U7-G valves. Reference to a valve data handbook shows us that each valve requires a screen voltage of 100 volts at 2 milliamps. Since we have two valves, the total current drain will be 4 m.a.

Assuming a supply voltage of 250 volts, let us determine the value of the series dropping resistors in Fagure 4 (a) under the conditions of maximum screen current.

Using the formula R equals E/I x 1000, we obtain 150/4 x 1000, or 37,500

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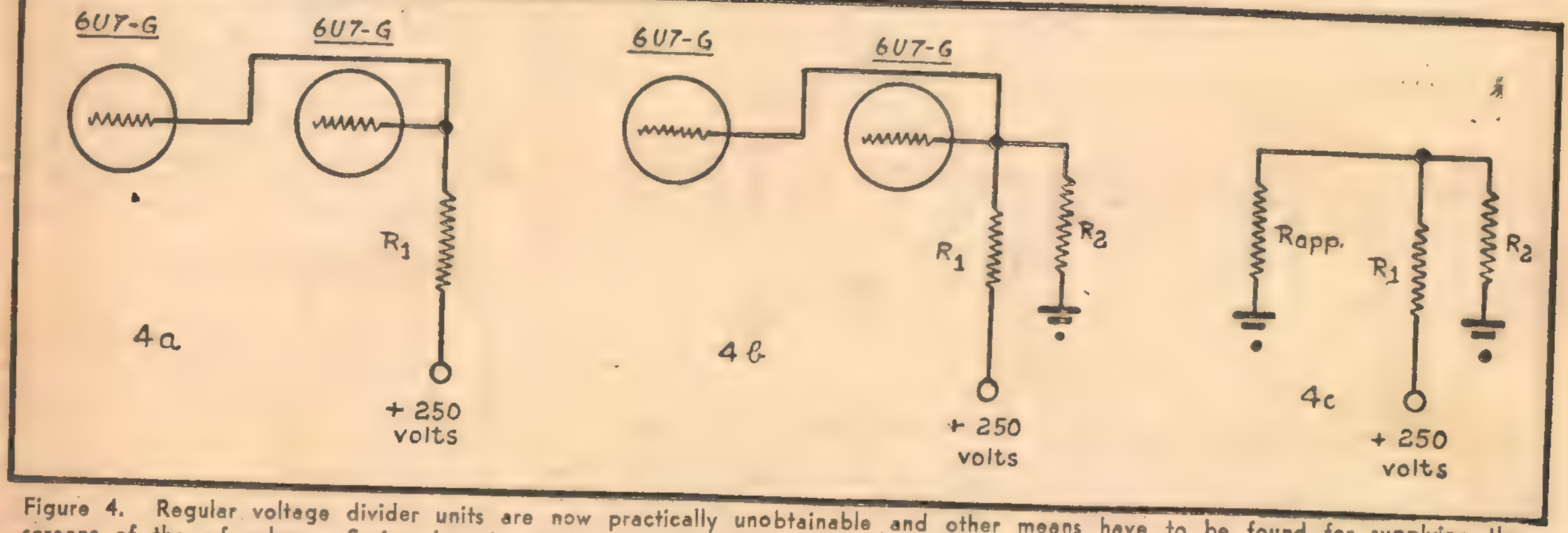


Figure 4. Regular voltage divider units are now practically unobtainable and other means have to be found for supplying the screens of the r-f valves. Series dropping resistors are often unsatisfactory (see 4a) and it is necessary, instead, to arrange a high resistance divider network as shown in 4b. For the purpose of calculation the load of the screens is treated as an apparent additional resistor, the equivalent circuit being that shown as 4c.

THE MONTH ON SHORT WAVES

SHORT-WAVE LISTENING

A FEW HINTS FOR BEGINNERS

by Ted Whiting

There are many of us who, on obtaining a new receiver, find that there is far more entertainment on the Short Wave bands than was ever thought possible. We have all heard of the stories that reception on these bands is always noisy and of no moment. It is to these new friends that we write this month in this Beginners' Issue.

WE receive many letters from our new listeners asking varied questions about short-wave reception. We have a letter from a reader in Victoria who asks:—

Would the BBC stations verify a report with a card or letter, what do I have to report in order to obtain a verification card, and what is the best form of aerial to use for reception on the Short Wave bands? This letter prompts us to write a few words which we hope may help this young man and many others who are in a similar quandary.

GENERAL CONDITIONS

At the outset, it is well to acquaint ourselves with conditions in general over the bands to be used and to get an idea of the stations which may be heard at the time of listening. Recourse should be made to "When and Where to Listen" and, by the help of this section, a knowledge of likely stations will be gained.

A start should be made on such signals as those of the Daventry transmitters, since the bulk of their programmes are conducted in English These stations should be logged, carefully noting the position on the dial where they are received.

We may then devote our attention to some of the stations, which only use English in their news broadcasts and for special transmissions. Try and learn to recognise them by any peculiarity in their transmission or by their use of announcers and announcements. These stations invariably announce in their own language as well as our own, and, by listening to this, we soon find we can recognise the language used.

Then we may turn our attention to the weaker signals, and in their turn we find that they ultimately become quite easy to identify. These are the stations which make our hobby so absorbing and require more concentration in order to understand what they are saying.

MAKE NOTES

When a new signal is heard it is the best practice to make complete notes of the details of the transmission and the times of the transmission, for, ultimately, these will form the basis of the report to be sent to the station heard Moreover, these details will have to be checked with the station log before a verification card is sent out. The main details to be noted are the time of reception, the strength of the signal and the items heard, together with any peculiar details which may be of interest to the station staff.

REPORTING RECEPTION

The report should contain all the items mentioned previously and should be written in English, unless the writer has a sound knowledge of the native language of the station concerned. The time is best reported in the local time of the station, if known, or in GMT.

Give the titles of the items heard and, if possible, give details of the announcements word for word when they are heard in English The type of interval signal should be stated where any is used, and finally the date of reception.

The addresses of many stations have appeared from time to time in these pages, and many more will appear in future issues. Any address can be supplied on request through the medium of these pages.

ATTACH POSTAGE

Be sure at all times to attach the correct postage to the report, and, in addition, to enclose the return postage in its most convenient form, by the use of an International Reply Coupon. It is well to inquire at the post office as regards the prospect of the letter being refused for transmission in the present time of emergency.

Be certain that no codes are used in your report, as these may be returned to you by the censor. Readers are invited to send us their reports each month.

We are at all times willing to help any of our listeners, and more especially the new recruits to our ranks. Anyone having a problem station is invited to let us hear about it and we will endeavor to identify it and answer the problem in our pages.

If an early reply is required, we would ask that the customary stamp be enclosed, and we will show our appreciation in a tangible way. We are always glad to receive your reports, and would suggest that they be grouped as in the "Listen For These" pages, as it assists us considerably in the compilation of these notes.

ABOUT AERIALS

We are of the opinion that the best type of aerial for use on the Short-Wave bands is the old inverted L type. We are not impressed with the results achieved by the use of directional aerials, due mainly to the fact that they do not always resonate in the bands we are in the habit of using. They are also unwieldy and cost quite a lot of money to erect, and for that reason they are usually passed over by the average listener.

However, it will be found that the inverted L aerial will give results which will please the most fastidious listener.

REPORTS FROM OUR READERS

THE following readers have sent in reports and letters for which we are very grateful:—

A. Cushen, Invercargill, NZ; R. Lean, Surry Hills, NSW; R. K. Clack, Home Forces; H. Perkins, Malanda, Q; J. N Paris, Prospect, SA; J Buckley. Goulburn, NSW; N A Hanson. Merrylands. NSW; A. S. Condon, Laura. SA; W Frost, Ashbury. NSW; A T Johnson Maylands, WA J. V. Baker. Ryde NSW; P. M nish,. Hilton, SA; R. Hallett, Enfield, NSW; R. Francis, Erskineville, NSW; Mrs. A. D. Wass, Carinda, NSW; E. L. Fleming, Burwood, Vic., G. Rhodes, Canberra, ACT; Miss D Sanderson, Malvern, Vic.; B Cragen. Bellevue Hill, NSW; Dr K. B Gaden, Quilpie, Q; N. Gunner, Stanmore, NSW; Mr A. Lee, Merewether NSW; G. Wilson. Albert Park. Vic.; G. Latham Warrawee, NSW. M Foster Mount Vincent NSW; E. Jamieson, Forreston, SA: R. G Gillett, Dudley Park. SA; G. Smart, South Caulfield, Vic.; L. Walker, Applecross, WA.

WE will be glad at any time to receive reports from any of our readers, which we will acknowledge in our notes each month. These reports should preferably be sent direct to us at 16 Louden-street, Five Dock, NSW. rather than to the Editor, as by so doing unnecessary delay is incurred.. We will endeavour to write personally to each one as soon as we possibly can.

WHEN AND WHERE TO LISTEN

Here is a chart for quick reference, giving the call and listening times for the best short-wave stations on the air. Where the station is not receivable at good strength when it comes on the air, the time is given at which reception should be satisfactory.

6 a.m. TILL NOON

Radio Cairo, 50.17m. Closes at good strength at 6.30 am.
CSW6, 27.17m, Lisbon. An excellent signal at from 6 am.
DXM, 41.27, Berlin. Good in news 6.30 am.
TPZ2, 33.48m, Algiers. Also a fine signal at 7.5 am on opening.
GRY, 31.25m, London. Good at 8 am.
GSD, 25,53m, London. A fine station heard at 8.30 am to noon.
GVR, 24.29, London. Terrific signal at 9 am.
WRUW, 30.93m, Boston. Heard well at 9 am.
Best reception period from 8 am to 11 am.

Please send reports for next issue to reach us not later than Saturday, July 4, 1942.

NOON TILL 6 p.m.

GSD, 25.52m, London. Good in NA service till 2.45 pm.
KGEI, 19.57m, San Francisco. Fair signal at 1 pm.
KWID, 19.62m, San Francisco. Good at 1 pm to 3 pm.
2RO4, 25.4m, Rome. A fine signal at from 2 pm.
OIX3, 25.46m, Helsinki. Good signal at 3.30 pm daily.
KRCA, 31.65m, San Francisco. Very loud at 5 pm.
TPZ2, 24.76m, Algiers. Still heard well at 5.45 pm on opening.
FK8AA, 48.94m, Noumea. Worth listening for from 5.30 pm.
Best reception period 1 pm to 5.30 pm.

6 p.m. TILL MIDNIGHT

KGEI, 41.38m, San Francisco. Good from opening at 6 pm.
JZJ, 19.79m, Tokio. Heard in news at 7 pm.
WJQ, 30m, New York. Very powerful signal from 8 pm.
CBFY, 25.54m, Montreal. Heard well at 9.30 pm.
GSF, 19.82m, London. Good signal in Eastern Service at 8.45 pm.
Radio Saigon, 25.47m. Good at 9 pm.
LRX, 31.06m, Buenos Aires. Fair at 8.45 pm.
WRCA, 19.81m, New York. Good strength at 11 pm.
XGOY, 31.17m, Chungking. News is heard at 11.30 pm.
Best reception period from 9 pm to midnight.

NEW STATIONS OF THE MONTH

America—Hawii—Philippines—Java—Europe

LRX, BUENOS AIRES

Although this one is not strictly a new one, it is a novelty to most of us to find that they may be heard at 8.30 pm at fair strength. They operate on 9660kc, 31.06m, and are heard at 9 pm closing. There is a distinct possibility that this one will improve in strength as our winter develops. At 9.15 pm LUR takes the air on 15,290kc, 19.62m. As yet we have not heard this latter one.

KID, KAHUKU, HAWAII

ANOTHER new one is now to be heard from this alluring group of islands. This station is heard at 10 pm on a frequency of 8420kc, 37.32m. The station is engaged in a point to point transmission with KZH in San Francisco, and as usual a very interesting programme is to be heard. These point to point transmitters are always worth watching, as some very fine programmes are to be heard.

BATAVIA

A station that has intrigued us all has now at long last been identified as JBC, operating in the once Dutch colony of Java. This station was forecast in this magazine as being located in that part of the world, and we are pleased to know that one of our readers in the person of Mr. G. Smart has been able to place them. The station is heard here daily operating on a frequency of 18,007kc, 16.60m. They operate on a schedule which is as follows: 7.30 am to 9 am, 12 noon to 1.30 pm, and 8 pm to 12.30 am. We consider it likely that the Japanese are using the old station located in the same city, only, of course, on a different frequency.

MTCY, HSINKING

There is a further outlet from this centre which is being heard on 52.28m, 5740kc. This one is heard at midnight with a good signal and one which seems as though it may stand the test of time. At 12.5 am the news is read in English. The station, after playing a few dance numbers, is heard to close at 12.30 am. Mr. A. S. Condon, of Laura, SA, is to be thanked for first reporting this station.

NEW SWISS STATION

WE are indebted to the Swiss Consulate for the information that the station, HER3, is about to undertake a new service for this country, commencing at the end of June. The broadcasts will be made on Tuesday and Friday only. Swiss Radio are interested to know the hours and the most suitable frequencies to use in order to give the maximum coverage. Any readers who may be able to help are requested to write to us and we will compile the data and despatch it to the authorities interested. We suggest that an ear be given to all bands, as a decision is yet to be made as regards the band to be used.

RADIO METROPOLE

A pro-Fascist station is being heard here on a frequency of 11,740kc, which corresponds with a wavelength of 25.56m. This one may be mistaken for just another Russian as they use that language in addition to the Ukrainian tongue. The strength is mainly good and is audible at 1.15 am to 1.25 am.

RADIO CALEDONIA

The above is the designation given to a new station which is being heard in the morning at the hour of 6.45 am. The station operates on 42.81m, 7010kc, and by the subject matter broadcast would appear to be yet another German anti-British station rather cleverly concealed. The main object of the broadcasts seems to be the rupture of the Scotch from the British. The announcer states in English that they operate from 9.45 pm to 11 pm, which would correspond to Central European time.

KZRH, PHILIPPINE ISLANDS

Our friend, Mr. Clack, informs us that this station is now operating on 11,600kc, 25.86m. They announce as "The Voice of the New Philippines," and are to be heard with news in English at 10 pm. The announcer is a lady, speaking in English. This is yet another of those stations which we hope will not be in operation for any length of time.

WCDA, NEW YORK

Yet a further transmission is to be heard these days, which is being radiated for the benefit of American forces in various parts of the world. This new one is WCDA and is operating on 17,830kc, 16.8m, and also on 6170kc, 48.60m, The former is heard at 7 am until 9 am, and news in Spanish can be heard at that time. The other transmission is heard at 10 am till 1 pm. This is unfortunately a bad time for reception in this country, but the former transmission is being heard well in parts of this State. The broadcast is made in parallel with WCBX and WCRC.

WITH OUR S.W. REPORTERS

Mr. N. A. HANSON

THIS month we would like to introduce to our readers one of the younger of our fellow-enthusiasts, in the person of Mr. N. A. Hanson, of Merrylands.

Mr. Hanson is a SW listener and reporter to this and other magazines of some long standing, and has in the course of time had no little success.

8 VALVE RECEIVER

A very fine home-constructed receiver is operated at this post, and is made up of two units, making the tally of valves in use some 12. The receiver itself consists of a 6L7 mixer and an electron coupled oscillator using a 6D6. This is followed by two IF stages using a 6D6 and a 6L7, which feed into the 6B7 second detector and first audio stage.

A further stage of audio amplification is added by a 76 type valve. A noise limiter is also available using a 6C6 and a 6H6, and works in conjunction with the second IF stage.

At present the coils wound cover only the 15mc, 11mc, 9mc. and 6mc bands, but it is the hope of Mr. Hanson to eventually complete the job and cover the whole spectrum. The coils are wound on standard 1½in. formers and consist of a full set for each band.

The well-tried method of bandspread is installed, and a very satisfactory spread of 2kc per dial division has been achieved. Calibration has been made on most bands and is being completed on the others.

An inverted L aerial has been erected having the following dimensions: 21ft. high by 25ft. long and is slung in a SE by NW direction.

VERIFICATIONS

Although Mr. Hanson claims that he does not pay much attention to the collection of veri's, he has cards from JZJ, JZI, JZR, VLQ, ZHP1, PMH, PMC, PLE, PLN, PLQ8, and in addition has letters out to XMHA, KGEI, KZRH, VPD2, and VQ7LO. The lastnamed being a recent addition to his list of stations heard.

The whole receiver unit is mounted in a Masonite fronted rack, no doubt making a very imposing array.

SEVEN MYSTERY STATIONS

THERE are quite a few stations heard at the present time which fall under this heading, and we therefore list them for your benefit, in the hope that in the next few weeks we may be able to identify them.

9750kc, 30.77m.—A Free French station heard at about 3.30 pm at fair strength at our location. This one has been reported as heard by several readers.

10,525kc, 28.50m.—This one is very definitely anti-British and may be heard at good strength at 12.30 am. At 12.53 am they are heard signing off with a long announcement which is unfortunately usually marred by interference.

15,310kc, 19.60m.—By way of a change we have an anti-Fascist station, with a transmission in German. It is heard from 9.30 pm to 9.50 pm at fair volume, but closes without giving any clue as to identity.

15.360kc, 19.53m.—Another one of the same breed, also heard in German at 8.30 pm to 9 pm. This one is the transmitter of the Friends of the SA and at some times puts in quite a good signal.

16.90m. (approx.).—This is the now famous ABC station which we have all heard from time to time in the last few weeks. This one has also been heard in the 19m. band, and in addition on about 18m. At the present time it is heard at 1.15 pm.

47.60m.—This one is believed to be located in Italy, as the familiar interval signal has been heard occasionally. We heard this one at 6.40 am in a French transmission. The strength was very good and clear.

A new station is coming in lately on approximately 51m. The matter broadcast places them as a relay of CR7BE, located at Lourenco Marques, as also the times of transmission correspond very closely. The station closes with the Portuguese National Anthem. This one is being heard at greater strength in the south than at this location.

FLASHES FROM EVERYWHERE

ARGENTINA.—We are informed that LRU, Buenos Aires, is now operating from 9.15 pm on a frequency of 15,290 kc, 19.62m. This transmission may be heard before long, as the band shows signs of opening up a little earlier. At the present time it is doubtful whether it can be heard at this time, but it is worth while trying for at around 11 pm.

HONGKONG.—We would quote our contemporary and at the same time thank them for their kind remarks published in their columns:—

"I read where someone was asking for the call-sign of the station heard on the wavelength of ZBW3, Hongkong. I figure the letters JTHK could stand for Japanese Territory, Hongkong. We might prefix JTHK with another T for Temporary Japanese Territory."

THIS MONTH'S VERIFICATIONS

BOLIVIA.—This rare country is reported to be sending out a very nice card for their stations on 6110kc and 9505kc. The call-signs are CP2 and CP38. The card shows a view of La Paz and carries the call CP3, which is the broadcast band outlet in addition to the previously mentioned stations. The station address is "Radio Nacional de Bolivia," Casilla Correo N. 596, Plaza Venezuela 34, La Paz, Bolivia.

CUBA.—It is very pleasing to learn that cards and interesting reading matter are still being sent out in response to correct reports of reception of Station COK. This popular station, which is being heard well at the present time, has always been noted for its consideration towards the Short Wave listener.

LOURENCO MARQUES.—Many cards have been despatched from this station to listeners in Australia. There is plenty of scope for the veri. hunter, as there are several stations operated by the Radio Club of Mozambique. These were detailed in the June issue of "Radio and Hobbies."

CHINA.—Those who have letters out to China should not despair, as one of our reporters, Mr. G. Smart, has just received a card from XGOY, in response to a letter sent last year. The card took over six months to make the journey via Kuoming and the Burma Road.

PROPAGANDA STATIONS

IN these days of world upheaval we find an ever-increasing number of stations disseminating various shades of opinion from various parts of the world. Some of these are very interesting, while others are ridiculous in the extreme. However, it is evident that they are believed by some people, and therefore we stress the necessity of not repeating the so-called facts heard from these stations. Not only is this repetition dangerous to our cause, but it may at times cause many people much distress and unnecessary worry for the safety of their loved ones.

KWID, SAN FRANCISCO

WE are afraid that we made an erroneous statement as regards the ownership of Station KWID, located in San Francisco. We stated that the station was owned and operated by Press and Wireless Inc., whereas they are the owners of WJQ, located in New York. The former station is operated by broadcast station KSFO, as we originally reported in this magazine some months ago. The studios for this station have been erected at a cost of 75,000 dollars, and are situated in the Hotel Mark Hopkins at Nob Hill, San Francisco. The aerial power is 100kw, which accounts for the punch with which we hear it. We stand correction by Mr. Cragen, to whom we are much indebted for this interesting information.

OVERSEAS S.W. STATIONS NOW AUDIBLE

The list of stations shown below comprises only those which have actually been heard in this country during the past few weeks, and does not include stations which are on the air but not heard as yet in this country. A large majority should be heard on any sensitive receiver, and when a station is reported for the first time readers' names who report it are shown in brackets. At the end of each group is a list of correspondents who have sent in reports.

ALL TIMES SHOWN ARE EASTERN STANDARD TIME.

ENGLAND

GSA—6050kc, 49.49m, Daventry. A European service staton heard at 6.30 am and 5 pm.

GSB—9510kc, 31.55m. Heard well in African and Pacific services. 5 am and from 3 pm.

GSC—9580kc, 31.32m. Reliable signal at 8 am until 2.45 pm, in American service.

GSD—11,750kc, 25.53m. One of the stars of the BBC. Heard in the African, North American, Pacific, and Eastern services.

GSE—11,850kc, 25.29m. Heard occasionally at 5 pm with a poor signal.

GSF—15,140kc, 19.82m. Another very fine signal at many times during the day. Used in the African, Pacific, and Eastern services.

GSG—17,790kc, 16.86m. Still being used and heard in the Pacific service. Heard at 5 pm with fair signal. Heard also in French transmission at 8.45 pm daily.

GSH—21,470kc, 13.97m. Has not been heard lately owing to seasonable conditions. Will come again in the summer.

GSI—15,260kc, 19.66m. Used in the Pacific service, and is heard from 5 pm.

GSJ—21,530kc, 13.93m. Another one which will not be heard until the return of summer conditions.

GSL—6110kc, 49.10m. A reliable station heard at 3 pm with good signal, Pacific transmission.

GSN—11,820kc, 25.38m. Heard at 11 am in foreign service. Also in European service at 6.30 am and 11.30 pm.

GSO—15,180kc, 19.76m. Also used in the foreign service, when it is heard well at 10.15 pm.

GSP—15,310kc, 19.60m. A Pacific service station heard from 3 pm. The strength of this one is not always so good.

GST—21,550kc, 13.92m. The same remarks apply to this one as to the other 13 metre band stations.

GSV—17,820kc, 16.84m. Still heard well at around 9 pm in the Eastern service.

GSW—7230kc, 41.49m. A good signal in the European service at 5 pm.

GRD—15,450kc, 19.42m. Heard well at 2 am in the African transmission.

GRE—15,375kc, 19.51m. An Eastern service station which is heard at from 8.45 pm at good strength.

GRG—11,680kc, 25.68m. Fine signal at 5.30 am in the African service, and at 6.45 am in the transmission to N. America.

GRH—9825kc, 30.53m. The best signal heard in the N. American service at this location. Can be heard through from 7.30 am until 12.30 pm.

GRI—9415kc, 31.86m. Still heard irregularly at 9.30 pm.

GRJ—7320kc, 41m. Another European service station which can be heard at both 6 am and 6 pm.

GRK—7185kc, 41.75m. This one is used in the Home service at 3 am and at 6 pm. This one reaches great volume here.

GRM—7250kc, 41.38m. This one is still heard as Radio Polski in transmission to Poland at 2 am.

GRN—6194kc, 48.43m. Heard well at 5 am.

GRO—6180kc, 48.54m. Used in African Service at 3 am.

GRP—17,890kc, 16.77m. This one is not in use now.

GRR—6075kc, 49.38m. Heard at both 2 am and 4 pm in the Home service.

GRS—7065kc, 42.49m. One of the loudest stations used in the Pacific service, commencing at 3 pm.

GRU—9450kc, 31.75m. Still operates in the African service, and is heard at 1.30 am.

GRV—12,040kc, 24.92m. A very good signal in the forenoon, which is heard well in the eastern States. The transmission is directed to Latin America, the language used being Spanish.

GRW—6145kc, 38.82m. Heard in team with GRR.

GRX—9690kc, 30.96m. A good signal in the European service at 5 pm.

GRY—This one is heard in the African and N. American services at 6.45 am and from 8.45 am.

The following readers have reported stations in the above group: Messrs. Perkins, Clack, Gaden, Gunner, Lee, Wilson, Latham, Condon, Gillett, Jamieson.

INDIA AND ASIA

VUD2—6130kc, 48.94m, Delhi, India. Heard at fair volume at 11 um, nightly.

VUD3—15.290kc, 19.62m, same location. Heard at good strength in the news at 12.30 pm. As forecast, this one is on the improve.

VUD4—9590kc, 31.28m, same location. A good signal at 9 pm on opening.

VWY—9045kc, 33.17m, Kirkee, India. This one announces as "Radio Francais de Libre d'Orient." The transmission is for the benefit of listeners in Syria.

The Voice of Free India, 11,500kc, 26.09m, and 9380kc, 31.90m. Heard on the latter frequency until 1 am, and after on 15,000kc.

XGOY—11,925kc, 25.14m, Chungking, China. Heard well from 6.30 pm. Is very loud at 11 pm.

XGOY—5050kc, 50.42m. Also heard well at both 10.30 pm and 6 am.

XGOY—9625kc, 31.17m. Good signal at midnight, when the news in English is heard.

XGOY—9635kc, 31.13m. This one is heard in special transmissions. These are directed to various parts of the world.

XGOA—9820kc, 30.86m, Chungking. This one is audible at 10 pm.

XGOI—9300kc, 32.36m, Shanghai. News in English is readabel at 10.15 pm.

XGOI—9665kc, 31.04m, same location. This one is much better than the transmission on 32.36m, heard from 9.15 pm at good strength, and is

XGOK—11,650kc, 25.75m, Canton. An irregular station. Signal is often good when it is heard.

XGOX—15.200kc, 19.74m, Chungking. A fine signal at 7.30 pm, carrying the news in English.

XGRS—11,640kc, 25.77m, Shanghai. The German-owned station which is heard at good strength every night. English is spoken.

XPSA—8465kc, 35.44m, Kweiyang. A transmitter carrying a native type programme, which is heard at 6.30 am and 9.30 pm.

KGAP—6100kc, 49.18m, Pekin. Operates at the midnight hour. Heard well at that time.

XLMA—9350kc, 32.09m. This one is a poor signal at 10.15 pm.

XMHA—1,855kc, 25.30m, Shanghai. A fair signal, but is hard to separate from DJP.

XIRS—11,890kc, 25.04m, same location. Another Axis-owned station, this time by the Italians. Fair signal, but is now on the decline.

KGEI—16,092kc, 19.65m, Kuoming. Is testing these days at about 9.25 pm. A very fine signal is heard.

FFZ—12,060kc, 24.88m. This one is spoilt by morse interference, but when in the clear on rare occasions is a very fine signal.

MTCY—11,775kc, 25.48m, Hsinking, Manchukuo. Operates in the early evening, when a good signal is heard.

MTCY—9545kc, 31.43m, same location. Is on the air with a fair signal from 7 am till 8 am.

Radio Saigon, 11,780kc, 25.47m. An old regular heard by most of our readers. News in English is heard at 9.30 pm.

Radio Saigon, 6188kc, 48.48m, same location. Opens at 10 pm with the same programme as the 11,780kc station. News is read at 10.15 pm and 1.45 am.

CR8AA—6250kc, 48.00m, Macao, Portuguese China. Still heard when conditions are good. Best time to hear this one is 11 pm.

HSP5—11,715kc, 25.61m, Bangkok, Thailand. Easily recognised, due to the fact that a lady announcer is on duty. News is read at 10 pm.

KZRC—6100kc, 49.18m, Cebu, Philippine Is. The only station in these islands under American control. Still audible.

KZRH—9640kc, 31.12m. Heard again, only under Jap control. News at 11.30 pm at 11.45 pm.

KZRF—6140kc, 48.86m. Also under Jap control. News at 10.15 pm.

EQB—6155kc, 47.74m, Teheran, Iran. Heard well at 4.45 pm, when a transmission in English is made.

ZHJ—6095kc, 49.21m. This one is only heard irregularly, and is, of course, under Japanese control. Heard at the usual time of 9 pm.

JTHK—9525kc, 31.50m. Still audible at 11 pm. The strength is very good.

JZJ—11,800kc, 25.42m, Tokio. Heard well at 7.30 pm.

JIE2—9695m, 30.95m, same location. News is heard at 9.30 pm and 11.30 pm. Good signal.

JLU4—17,795kc, 16.86m, same location. Heard putting in a very fine signal at 6 pm.

ZNR2—12,115kc, 24.76m, Aden. Is now being heard at 3.45 am with a weak signal, but will improve as the winter sets in.

Radio Levant—8030kc, 37.34m, Beirut, Syria. Heard at good strength at 2.45 am.

WHO'S WHO IN SHORT-WAVE BROADCASTING

CBFY, Montreal, Quebec, Canada

Frequency 11.745kc. Wavelength 25.54m.
Operating schedule: 9 pm to 2 am.
Standard time: 14 hours behind EST.
Distance from Sydney: 10,000 miles.
Postal Address: Canadian Broadcasting Corp., Keefer Building, Montreal, Quebec, Canada.
Identification: Announces with male in both French and English. News is given in both languages.
Verification details: Sends out nice card.

HCJB, Quito, Ecuador

Frequency 12,460kc. Wavelength 24.08m.
Operating schedule: 9 pm to midnight daily. 8 am to 8.45 am Mondays.
Standard time: 15 hours behind EST.
Distance from Sydney: 8600 miles.
Address: Compania Radiofusora del Ecuador, PO Box 412, Quayaquil, E'dor.
Identification details: Announces as "La Vox de Los Andes" in Spanish; also uses Portuguese and English in some sessions.
Verification details: Sends large card in black and white.

SUP2, Cairo, Egypt

Frequency 5990kc. Wavelength 50.08m.
Opetating schedule: 5 am to 8 am.
Standard time: 8 hours behind EST.
Distance from Sydney: 8000 miles.
Postal Address: Egyptian State Broadcasting Corp., Radio House, 5 Sharira Eloui, Cairo, Egypt.
Identification: Announces in both English and French.
Verification details: Sends the usual card rather promptly.

NEW STATION LOGGINGS

THE following new stations have all been definitely heard and identified at our location since our last issue. Where call letters are not as yet shown, station is listed under its location.

Kc	Meters	Call	Location
8420	37.32	KIO	Hawaii.
9660	31.06	LRX	Buenos Aires.
11600	25.86	KZRH	Manila, PI.
17830	16.80	WCDA	New York.
18007	16.60	JBC	Batavia.
5740	52.28	MTCY	Hsinking, Manchukuo.
7010	42.81	—	Radio Caledonia.

The following readers reported stations in the above group: Messrs. Clack, Baker, Johnstone, Perkins, Rhodes, Gaden, Gunner, Cushen, Lee, Latham, Condon, Smart, Walker, Gillett, Jamieson, Mrs. Wass, Miss Sanderson.

NORTH AMERICA

WGEA—6190kc, 48.47m, Schnectady, NY. Can be heard in some districts at 8.30 pm, on opening.

WGEA—9550kc, 31.41m, same location. Heard from 8 am until 3 pm at good level.

WGEA—15,330kc, 19.58m, same location. News is heard at fair strength at 12.45 am.

WGEO—9530kc, 31.48m, same location. Heard carrying the same service at WGEA, 31.41m. Good signal.

WNBI—11,890kc, 25.23m, New York. Heard at 6 am daily, and at 5 pm, instead of WRCA.

WNBI—15,150kc, 19.81m, same location. Fine signal at 9 am and at midnight.

WNBI—17,784kc, 16.87m. A fair signal at 9.15 am and at 11 pm.

WRCA—9607kc, 31.02m, same location. Heard with an excellent signal at 4 pm. The programmes from this one are very good.

WCBX—15,270kc, 19.64m, same location. Still good in the forenoon, with the news in German and French at 12.30 am.

WLWO—15,250kc, 19.67m, Cincinatti, Ohio. A good signal at both 5 pm and midnight.

WLWO—11,710kc, 25.62m, same location. Heard as are most Americans at 9 am.

WLWO—9590kc, 31.28m, same location. This one is audible at 10 am on opening.

WBOS—11,870kc, 25.27m, Boston, Mass. Heard operating in parallel with WNBI from 8.30 am daily.

WBOS—15,210kc, 19.72m, same location. In parallel with WRCA, giving the news at midnight.

WRUL—11,790kc, 25.45m, same location. Yet another heard in the mornings at from 6.30 till 8.30.

WRUW—9700kc, 30.93m. This one is heard universally over the country. They open at fine strength at 6.50 am.

WRUW—11,725kc, 25.58m. Still heard well at 9 am.

WRUW—15,350kc, 19.54m. This outlet opens at 12.30 am.

WCW—15,850kc, 18.90m, New York. This is a station which is operating for the benefit of the troops. Heard well at midnight.

WJQ—10,010kc, 29.97m, same location. This one announces as on a wavelength of 30m. The programmes are very fine, as is also the news cover. The schedule of operation is 8 pm till midnight.

KWY—7184kc, 40.1m, Hawaii. This one has been heard taking some very interesting location broadcasts in their point to point service. These stations do not verify as a general rule.

KGEI—15,330ks, 19.57m, San Francisco, Cal. A very good signal in the bush from opening at 9 am, but in the cities is heard from about noon. News at 1 pm.

KGEI—13,690kc, 21.91m, same location. Heard fairly well at 2.30 pm.

KGEI—7250kc, 41.38m, same location. Heard from opening at 5 pm, when it is very loud, until early am.

KEL—6860kc, 43.73m. The location of the transmitter is at Bolinas, but the programmes are those from the KGEI network. This one is a good signal at 10 pm.

KET—9479kc, 31.65m, same location. Good signal at 3 pm.

KRCA—9010kc, 33.29m, same location. This one is used in special transmissions, but has been heard carrying the same relay as the KGEI group.

KRCA—9991kc, 31.60m, same location. Still on their weekly schedule. Sunday, at 3 pm. Very good signal.

CBFY—11,750kc, 25.63m, Montreal, Canada. This one has now changed their frequency, and is now operating on 11,745kc, 25.54m. It is heard at 10 pm on opening.

CFRX—6070kc, 49.42m, Toronto, Ont. Heard well from 9 pm till 11 pm, at good level.

CJCX—6020kc, 49.83m, Sydney, NS. This one puts in a fair signal at 11 pm.

CBRX—6160kc, 48.70m, Vancouver, BC. A signal worth hearing at 12.30 am. They fade out by 2 am these days.

XONH—5970kc, 50.25m, St. Johns, Newfoundland. Still heard well at 11.30 pm daily. Listen for this one.

XEXA—6170kc, 48.62m, Mexico City, Mexico. Heard daily at midnight.

XEWW—9503kc, 31.57m, same location. This one is heard at this location from 1 pm on some occasions.

XEQQ—9680kc, 30.99m. This one also heard from shortly after noon now. Also audible at midnight.

XEFT—9550kc, 31.40m, Vera Cruz, Mexico. Heard fairly well from 4 pm until closing at 5 pm.

The following readers reported stations in the above group: Messrs, Clack, Baker, Johnstone, Perkins, Rhodes, Gaden, Gunner, Cushen, Lee, Latham, Condon, Smart, Walker, Gillett, Jamieson, Mrs. Wass, Miss Sanderson, Messrs. Hallett, Francis, Fleming, Frost, Paris, Buckley, Lean, Cragen, Hanson, Wilson, Foster.

CENTRAL AMERICA AND WEST INDIES

HY5A—11,700kc, 25.64m, Panama City, Panama. Still audible at 8 am, and, in addition, at 11 pm. This one is also heard at 4 pm.

HP5G—11,780kc, 25.47m, same location. This outlet is also heard at 11 pm daily.

HP5J—9607kc, 31.23m, same location. Although this one is not reported often, we hear it frequently at 10 pm.

HH3W—10,130kc, 29.62m, Port au Prince, Haitii. Heard in some locations at 6 am. This one is very patchy here.

HHBM—9660kc, 31.06m, same location. This one has not been heard for some time here. We are afraid that it is no longer operating.

HI2G—9295kc, 32.38m, Cuidad Trujillo, Dominican Republic. Heard on opening at 7.15 am with good signal. This one also worth looking for.

TIEP—6692kc, 44.81m, San Jose, Costa Rica. Heard well in the clear some nights at 9.45.

TIEMC—11,900kc, 25.21m, same location. Heard at 11 pm, but is subject to interference.

TIPG—9620kc, 31.19m, same location. Heard well in most districts at the present time at 10 pm. A good signal.

TILS—6165kc, 48.66m, same location. This is a good one to disturb the Sunday afternoon siesta. Good at 3 pm.

TGWA—9685kc, 30.98m, Guatemala City, Guatemala. This one is audible from 1 pm till 2 pm daily, but is also heard until 4 pm on Sunday.

TGWA—15,170kc, 19.78m, same location. Heard only on Monday morning, the best time is 7.30.

YNR5—8585kc, 34.95m, Managua, Nicaragua. This one can be heard well every night at 10 o'clock.

COBC—9365kc, 32.05m, Havana, Cuba. This one can be heard at good strength at 8 am, and, in addition, at 3 pm on Sunday.

COBC—9695kc, 30.94m, same location. Audible at good volume at 11 pm.

COCQ—8850kc, 33.90m, same location. This one is the most versatile of the Cubans, being heard at 7 am, 4 pm, and 10 pm.

COCO—8700kc, 34.48m, same location. Also heard with a good signal here. Listen for the English session at 10 pm.

COCX—9270kc, 32.36m, same location. Still accompanied by a very bad Morse obligato. We are still living in hopes. Heard well in other States, especially in SA.

COCW—6330kc, 47.39m, same location. Readable at 10 pm on opening.

COCH—9435kc, 31.80m, same location. This one is good at 10 pm, and also at 8 am.

COHI—6455kc, 46.48m, Santa Clara. Like most Cubans, is good at 10 pm.

COCM—9830kc, 30.51m. Have heard this one at last. We hear them fairly good at the usual time of 10 pm. Location is, of course, Havana.

COCY—9246kc, 32.43m. Can be picked out in the morning at from 7 o'clock.

COCY.—11,745ks, 25.55m., same location. We hear this one well at 3 pm. They often stay on the air later on Sunday.

COK—12,005kc, 25.93m. This one can be heard at 8 am, and on occasions at 1.30 pm. Used to be a very popular station.

The following readers reported stations in the above group: Messrs. Fleming, Perkins, Clack, Gaden, Cushen, Condon, Walker, Gillett, Jamieson, Foster.

SOUTH AMERICA

HJCX—6081kc, 49.85m, Bogota, Colombia. Although we are unable to get a readable signal from this one, we believe that they are being heard in some districts. Can anyone hear them in Sydney?

HCQRX—5972kc, 50.23m, Quito, Ecuador. This one also reported as being heard on opening at 9.45 pm.

HCJB—12,460kc, 24.08m, same location. This one is heard on Monday morning, and also at 9 o'clock every night. The broadcasts are of a religious nature.

CB960—9600kc, 31.25m, Santiago, Chile. Can be heard well at 3 pm, Sunday.

CB970—9735kc, 30.82m, Valparaiso. Heard well on opening at 9.30 pm daily.

CB1170—11,700kc, 25.64m. A weak signal at 2 pm.

CB1180—11,975kc, 25.05m. Can be heard opening at 9.30 pm, but is ruined by Morse interference.

OAX4J—9340kc, 32.12m, Lima, Peru. A good signal in the afternoon, at 2 o'clock.

OAK4G—6190kc, 48.47m, same location. Can be heard fairly well at 3 pm on Sunday afternoon.

OAZ5C—9540kc, 31.45m, same location. "Las Ondas di Ica para tod el pais." Very fine at 4 pm, Sunday.

CXA8—9640kc, 31.12m, Colonia, Uruguay. Audible at both 4 pm and 6 am daily with good signal.

PSH—10,220kc, 29.35m, Rio de Janeiro, Brazil. Weak when operating on Saturday morning at 9.0.

PSF—14,690kc, 20.42m, same location. Used in parallel with PSH. Weak signal at this location.

PRE9—6105kc, 49.14m, Fortelaza, Brazil. Quite good at 7 am, on opening.

LRX—9662kc, 31.06m, Buenos Aires, Argentina. A good catch these days at 8.30 am, in parallel with LSX. Fair signal.

LSX—10,357kc, 28.98m, same location. Heard weakly at 9 am.

The following readers reported stations in the above group: Messrs. Fleming, Clack, Gaden, Cushen, Condon, Walker, Jamieson, Foster.

AFRICA

ZOY—6002kc, 49.98m, Accra, Gold Coast. This unusual country can be heard at 5 am. The signal is very poor here.

ZRH—6007kc, 49.95m, Johannesburg, South Africa. Heard quite well at 6 am. The BBC news is taken on relay at 6.15 am. The network then closes.

ZRK—6097kc, 49.20m, Cape Town. This one is weak at our location.

ZNB—6900kc, 50.85m, Mafeking, British Bechuanaland. Can be heard at 6 am, but is inclined to be weak.

SUX—7865kc, 38.15m, Cairo, Egypt. This one uses Arabic exclusively. Heard here at 6 am.

SUP2—6320kc, 47.47m, same location. Can be heard with a fine signal at 2 am.

Radio Cairo—5980kc, 50.17m. Heard daily at 6 am. Rather patchy at times.

Radio Addis Ababa, 9625kc, 31.17m. This one closes with an announcement in English at 1 am.

Radio Tananarive—6063kc, 49.48m. One of our pet stations. Can be heard at 11.30 pm, and is audible until 2 am. At present the announcements are in French, but we understand they will be using English as well soon.

CR7AA—6300kc, 49.71m, Lourenco Marques, Mozambique. Can be heard best at 7 am.

CR6RA—9470kc, 31.68m, Luanda Angola, Portuguese West Africa. Heard at 5.30 am till 7 am.

FZI—11,970kc, 25.06m, Brazzaville, Free French Africa. Heard well at 4 pm and 5 am. News read in English.

OPM—10,140kc, 29.59m, Leopoldville, Belgian Congo. Closes with good signal at 5.30 am.

VQ7LO—6060kc, 49.50m. Still getting weaker. Will improve later in the year.

TPZ—12.120kc, 24.75m, Algiers. This station is easily receivable at 7.5 am, and even stronger at 5.45 pm.

TPZ2—8960kc, 33.48m, same location. Relays the sister station, but is very poor, as usual.

CNR—8035kc, 37.34m, Rabat, Morocco. We hear this one only very poorly at our location.

FGA—9410kc, 31.88m, Dakar, Senegal. Can be heard on opening at 5.45 am.

The following readers reported stations in the above group: Messrs. Jamieson, Gillett, Walker, Condon, Fleming, Cushen, Perkins.

AUSTRALIA AND OCEANIA

VLR—9580kc, 31.32m. National programme. 6.45 am to 11.30 pm.
VLR3—11,880kc, 25.25m. National programme. Noon to 6.15 pm.
VLR8—11,760kc, 25.55lm. National programme. 6.30 am to 10.15 am.
VLG2—9540kc, 31.45m. To N. America. 10.25 pm to 11.10 pm: To S.E. Asia, 12.15 am to 2 am.
VLG3—11,710kc, 25.62m. To N. America, 3.55 pm to 4.40 pm. To S.E. Asia, 8.40 pm to 9.15 pm.
VLG5—11,880kc, 25.25m. National programme. 8.30 pm to 10 pm.
VLG7—15,160kc, 19.79m. National programme. 6.30 am to 8.10 am, and from noon to 3.40 pm. This transmitter is also used in the oversea service from 6.25 pm to 8.15 pm.
VLQ—9615kc, 31.21m. To New Caledonia, from 7.25 pm to 8.25 pm.
VLQ2—11,870kc, 25.27m. Heard in parallel with VLG3 in the afternoon transmission. To S.E. Asia at 8.40 pm.
VLQ4—7220kc, 41.55m. To N. America from 12.25 am till 1.10 am.
VLQ6—9580kc, 31.31m. This one is used in the overseas service at 5 pm.
VLQ8—17,000kc, 16.85m. An outlet used in a transmission to England at from 5.55 pm to 6.15 pm.
VLQ9—7250kc, 41.38m. Heard well in transmission at 11.25 pm to 12.10 am.
VLW2—9615kc, 31.21m, Perth. National programme from 7.30 pm to closing.
VLW2—9650kc, 31.09m. This frequency is used in service to S.E. Asia at 12.15 am until 2 am.
VLW3—11,830kc, 25.36m. National programme. This one opens the day's transmission at 8.30 am.
FK8AA—6130kc, 48.04m, Noumea, New Caledonia. This one is forecast by our contemporary as being about to make much use of the English language.
The following readers reported stations in the above group: Messrs. Perkins, Gaden, Lee, Condon, Gillett, Jamieson, Miss Sanderson.

MISCELLANEOUS

OIX1—6120kc, 49.02m, Lahti, Finland. This station is now being heard at good strength at 1 pm.
OIX2—9500kc, 31.58m, same location. This second outlet is heard at 5.30 pm.
OIX3—11,870kc, 25.47m, same location. Heard well in relay with OIX2 at 1.30 pm.
HER3—6165kc, 48.66m, Schwarzenberg, Switzerland. Audible at 5.30 am in fine style. Closes at 7 am. French and German only are spoken.
HER5—11,865kc, 25.28m, same location. This one is still heard at 11 pm.
HVJ—6005kc, 49.96m, Vatican City. Heard irregularly at 5.15 am.
HVJ—11,740kc, 25.55m, same location. Heard in the P.O.W. service at 4 pm.
HVJ—9660kc, 31.06m, same location.
CSW6—11,040kc, 27.17m, Lisbon, Portugal. This one is now an old regular. A very powerful signal at from 4 am until 7.30 am.
CSW7—9740kc, 30.80m, same location. This one has again been reported as being heard from 7 am to 10 am.
Emissora Nacional—7350kc, 41.07m, Ponta Delaga, Azores. This unusual one can now be heard from 6 am till 7 am daily.
Radio Mediteranea—7035kc, 42.66m, Valencia, Spain. Opens at 6 am. Lady announcer. Takes a relay from Radio Malaga from 6.30 am to 6.50 am.
Santander—11,780kc, 25.27m, Santander, Spain. An interesting station, which is heard from 2.30 am to 2.45 am, giving news in Spanish.
EAJ22—7140kc, 42.02m, Oveido, Spain. This one is also heard taking the same relay as Santander. Heard at fair strength.
Radio Malaga—7141kc, 42.09m. Heard carrying the same programme.
Radio Malaga—7206kc, 41.61m. News in Spanish at 6.30 am. Then is the originating station for the relay heard immediately after. This is the loudest station of the group at this location.
TAP—9465kc, 31.70m, Ankara, Turkey. Heard in transmission in English at 5.15 am. This one is at good strength.
TAQ—15,195kc, 19.74m. Can be heard at 10.30 pm with good signal.
YUB—6100kc, 49.18m, Belgrade, Yugoslavia. Heard at 5.30 am. Announces in French.
SBP—11,705kc, 25.63m, Motala, Sweden. This one is coming in well these days at 11 pm.
SBU—9530kc, 31.46m, same location. Is now audible at 3.30 pm.
LKQ—11,735kc, 25.47m, Oslo, Norway. This Scandinavian is heard at 3 pm. The signal is a good one.
PCJ—9590kc, 31.28m, Huizen, Holland. This one is quite good at 7.50 pm on a good night.
PCJ2—15,220kc, 19.71m. We hear the news in English at 10.45 pm. Still heard at very fine strength at 12.30 am.
PCV—17,070kc, 16.60m. Heard on a particularly good night at 11. This one will keep for the return of the warmer weather.
Paris—6200kc, 48.39m, France. Can now be heard at 5.30 am. Fair signal.
Paris, 9520kc, 31.50m. This is a very good station at 5.0 pm daily
Paris—11,880kc, 25.25m. Another early station, heard at 5.30 am.
Paris—11,845kc, 25.53m. This one is also heard at the same time, and has been increasing in volume of late.
Paris—17,850kc, 16.80m. This one will also keep for later in the year as far as we are concerned.
Moscow—15,230kc, 19.70m. Gives the news in English at 9.10 am.
Moscow—12,060kc, 24.88m. Another one to use English at 10.30 pm.
Moscow—10,040kc, 29.88m. Also uses English at 11.30 pm.
Khabarovsk—9566kc, 31.36m. This one takes a relay from Moscow at 8 pm.
Kuibyshev—8047kc, 37.28m. News is read in English at 6 am.
Kuibyshev—9520kc, 31.51m. News at 6.30 am. This one is heard in contact with CBS and NBC at 10 pm.
Kuibyshev—6115kc, 49.08m. Also in the American hook-up. Heard at good strength.
2RO3—9630kc, 31.51m, Rome, Italy. A good signal at 7 am and at 3 pm.
2RO4—11,810kc, 25.40m, same location. Still a very fine signal at 4 pm.
2RO6—15,300kc, 19.61m. This one puts in a very good one at this location.
2RO8—17,820kc, 16.84m. Can still be heard when conditions are of the best.
2RO9—9670kc, 31.02m. This one has been heard well at 1.30 pm.
2RO11—7220kc, 41.55m. This is an outstanding station heard at 5 am at this location.
2RO15—11,760kc, 25.51m. Can be intercepted at 4 am with good signal.
2RO20—17,820kc, 16.87m. This one is very poor these days, or rather nights.
DJA—9560kc, 31.38m, Berlin. Heard well at 3 pm and through the afternoon.
DJB—15,20kc, 19.74m. A reliable station at 10.30 am and at 1 pm.
DJC—6020kc, 49.83m. Can be heard well at 5 am.
DJD—11,770kc, 25.49m. This is another one for the early riser. Heard at 5.30 am.
DJE—17,760kc, 16.89m. This one will also fade out soon, but is struggling along valiantly.
DJL—15,100kc, 19.85m. Heard in the news in English at 10.30 pm.
DJP—11,555kc, 25.31m. Still being heard at 6 am, 1 pm, and 10.30 pm.
DJQ—15,220kc, 19.63m. This one is good in the afternoon, and after 9 o'clock at night.
DJR—15,340kc, 19.56m. This one is heard at varying strength from 3 pm until 2 am.
DJW—9650kc, 31.09m. Works in parallel with DJA at from 3 pm.
DXJ—7240kc, 41.44m. Another fine signal on this band at 6 am.
DXP—6030kc, 49.73m. This is another colossal signal at 6 am.
DXR—11,760kc, 25.51m. Can be heard at 3 pm and at 9 pm.
DXX—6140kc, 48.86m. Gives the news in English at 5.30 am.
DXC2—11,740kc, 25.55m. This one is very strong on opening at 7.50 am.
DXL7—11,855kc, 25.30m. This one takes the same programme as DXC2.
DXL24—9620kc, 31.18m. Another one in the same relay.
DZD—10,530kc, 28.45m. Has not been quite as strong these last few weeks. Is headr when operating at 5.30 am.
The following readers have reported stations in the above group: Messrs. Hallett, Fleming, Baker, Johnstone, Gaden, Lee, Latham, Condon, Walker, Gillett, Jamieson, Mrs. Wass, Miss Sanderson.

WORK OUT YOUR OWN MATHS

(Continued from Page 45)

ohms. Therefore, if we connect a 37,500 ohm resistor in series with the screen leads we will obtain the 100 volts as required. However, the story doesn't end there.

If, with increased grid bias, the screen current was to drop to say, 2 milliamps, the screen voltage would immediately rise to 175 volts. Such an increase would largely counteract the efforts to reduce the stage gain by increasing the negative grid bias.

So to stabilise this somewhat, it is necessary to arrange a voltage divider system, which, in providing a bleeder current, will keep the screen voltage more nearly constant.

NEW CIRCUIT

This is done by connecting a resistor from the screens to earth, as shown in Figure 4b. As the screens are fed from the junction of two resistors strung between B plus and earth, we have the necessary voltage divider system. The next question is: How do we decide the value of R2.

You will note that we are now approaching the problem of a voltage divider network from the alternative angle mentioned earlier. In the first case, we began by assuming a certain definite bleed current and then proceeded to calculate the values of the resistors.

This time, we are preparing to assume values for the resistors, leaving the actual current drain to be calculated later.

From our valve data charts, we know that the screen of a 6U7-G valve draws 2.0 milliamps at 100 volts. Two together would draw 4.0 milliamps. Now, for the purpose of calculation, we can treat these two screens as a resistance, because they are passing a certain amount of current (through the valve) to earth in exactly the same way as a resistor would do.

This apparent internal screen circuit resistance for the two valves can be calculated by Ohm's Law. The applied voltage is 100 and the current flowing is 4.0 milliamps, so that the screen circuit is equivalent to a resistance of 25,000 ohms.

Now, it is apparent that this screen circuit resistance is really in parallel with R2. Therefore, we have a series-paralleled network comprising resistor R1 in series with the parallel units, resistor R2 and the apparent internal resistance of the screen circuit.

The value of R2 is not critical. However, the higher the value, the poorer will be the regulating effect; on the other hand, lower values improve screen voltage regulation, but draw higher bleed current and require resistors of higher wattage rating.

As the apparent screen circuit resistance of the two valves is 25,000 ohms, let us make the bleed resistor R2 the same value, since it is quite a convenient one. Now the net parallel resistance of R2 and of the screen circuits will be 12,500 ohms.

CURRENT FLOWING

If the screen potential is made equal to 100 volts, it follows that the total current to earth through the different paths will be 100/12.5 equals 8.0 milliamps. This will necessarily be the amount of current flowing through the supply resistor R1.

We know that the voltage drop across R1 has to be 150 volts and, knowing the current, it is a simple matter to work out the resistance. We work it out to be 18,500 ohms. This is certainly an odd value, but 20,000 ohms would probably be near enough.

(Continued on Page 56)

MR L. B. GRAHAM,
Principal of the A.R. College.

Do you know?—

ABOUT ELECTRIC MOTORS

Here is the concluding article in the series dealing with electric motors. The discussion centres around condenser, capacitor-transformer and squirrel cage motors. At the end of the article are a few general hints in regard to lubrication and overload protection.

CONDENSER MOTORS

THE main disadvantage with the repulsion induction type of motor is that after a time the surface of the commutator becomes dirty and the brushes worn. If the motor has not been subjected to overloads, and if the line voltage and frequency have been correct, the motor may not need attention, apart from lubrication, for a year or more; if conditions have not been ideal, rapid wear may have taken place and frequent attention becomes necessary.

The condenser type of motor, which has become fairly popular recently, has overcome this disadvantage to a large extent.

The stator or field magnet of condenser motors contains two separate windings. One winding, the "running" winding, is wound around pole pieces in the usual manner. The second winding, known as the starting winding, is wound around other pole pieces located in between the poles of the running winding.

The running winding is supplied with electrical power all the time the motor is operating, while the starting winding, which is connected in series with a large condenser, is connected to the mains by means of a centrifugal switch only when the motor is stationary or when it is revolving at a slow speed.

NO WINDINGS ON ROTOR

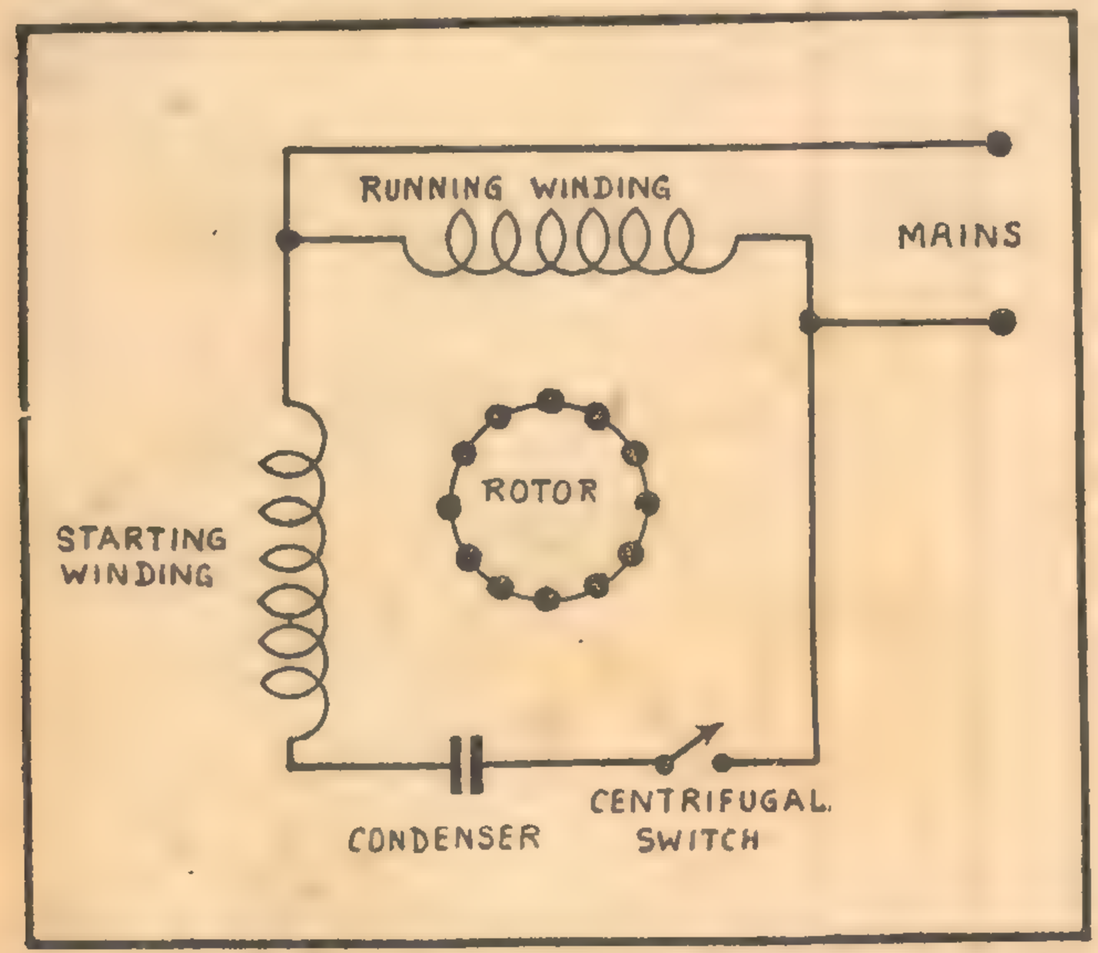
The rotor of a condenser type motor does not contain any windings, but consists of laminations of thin sheets of iron, which have holes punched out around their periphery. After the laminations are assembled on the shaft, copper bars are passed lengthwise through the holes and soldered to a copper ring at each end of the rotor. There are no electrical connections to the rotor, and consequently no commutator is necessary.

The electrical connections of a condenser motor are shown in Fig. 1.

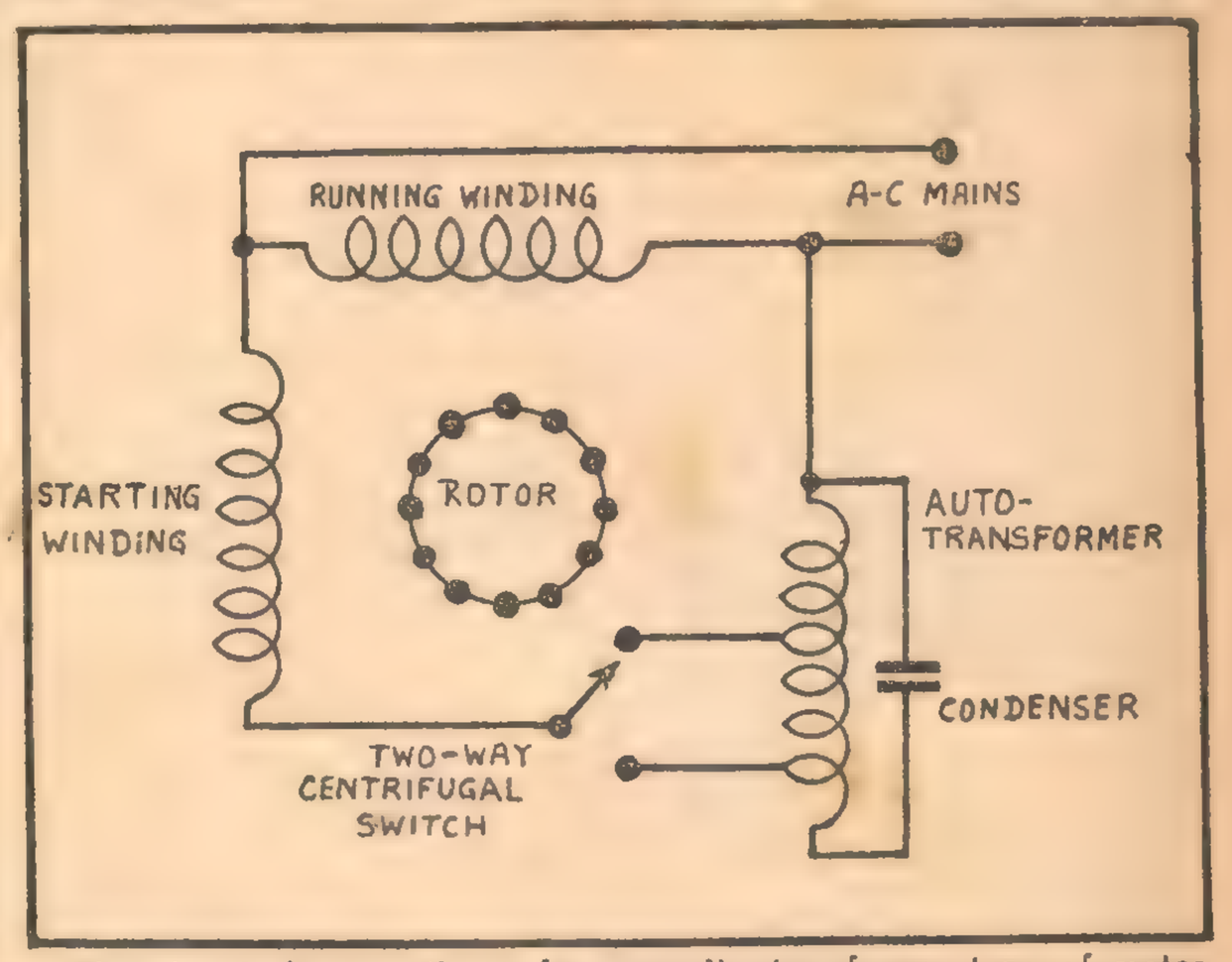
Alternating current from the power mains flows through the running winding and produces a magnetic field around it. The moving lines of force produced by the stator windings pass through the rotor and cause currents to circulate in the copper bars and rings. The lines of force produced by these currents, which are known as "eddy" currents, tend to make the rotor revolve, but the magnetic field produced by the running winding is not strong enough to enable the motor to start revolving.

When the motor is stationary or rotating at a slow speed, the centrifugal switch allows current to flow also through the condenser and starting winding. The extra lines of force produced by this winding enable the rotor to start revolving, and as soon as it reaches a definite speed, the switch comes into operation and disconnects the starting winding, thus reducing the amount of current consumed from the mains.

The purpose of the condenser, which is usually of the dry-electrolytic type, and which is mounted in a metal box on the outside of the motor frame, is to change the phase of the current flowing through the starting winding, so that the motor really starts as a



The electrical connections of a condenser motor. Note that there are no windings on the rotor. The starting winding is only in circuit when the motor is stationary or operating at low speed.



The electrical connections of a capacitor-transformer type of motor. The centrifugal switch alters the potential across the starting winding, according to the speed of the motor. There are no windings on rotor.

two-phase motor, and after reaching the speed at which the switch opens, continues to run as a single-phase induction motor.

CAPACITOR-TRANSFORMER MOTORS

Another type of motor, which has recently become popular, is built in a similar manner to the condenser motor, but has, in addition to a condenser, an auto-transformer. An auto-transformer consists of a winding of wire around a laminated iron core, the winding being tapped at one or more points.

In this type of motor the starting winding is connected by the centrifugal switch to a tap on the transformer winding, which supplies it with a high voltage for starting. When the rotor has attained about three-quarters of its normal speed, the switch disconnects the starting winding from its previous position and connects it to a tap supplying lower voltage, thus reducing the amount of power drawn from the mains. In this type of motor the condenser is in circuit and current flows through the starting winding all the time that the motor is operating.

ELECTRICAL CONNECTIONS

Fig. 2 shows the connections of a capacitor-transformer type of motor. The advantages of this motor are silent running, high efficiency and high power, both when starting and running.

Due to the fact that the condenser is in the circuit at all times, this motor really acts as a two-phase motor, although only supplied with single-phase alternating current, as the condenser changes the phase of current flowing in the starting winding, but not that flowing in the running winding.

The condenser is subject to severe stress the whole time the motor is operating, and has to be carefully constructed. It is usually immersed in oil.

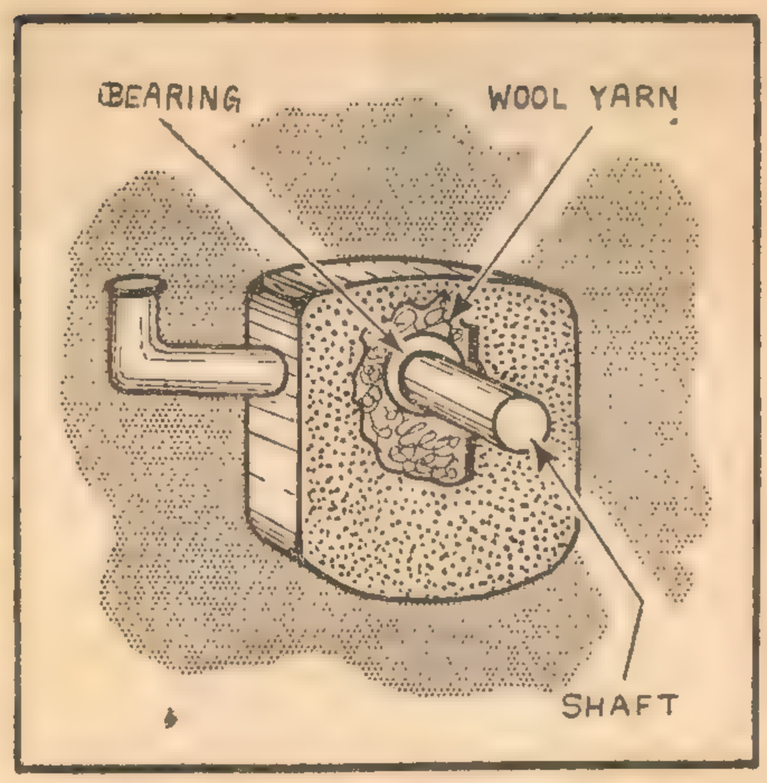
To change the direction of rotation of either condenser motors or capacitor-transformer motors, it is only necessary to reverse the connections to the running winding. Connections to the starting winding should not be changed.

The only parts likely to give trouble in either condenser or capacitor-transformer motors are switch contacts becoming dirty and defective condensers or auto-transformers.

MOTOR SPEED

Compound-wound motors for operation from DC mains are usually designed to rotate at 1725 revolutions per minute. The speed of AC motors depends on the frequency of the power supply. Most Australian towns and cities are supplied with power at a frequency of 50 cycles per second. Motors for 50 cycle or 25 cycle current are designed to have a speed of 1425 rpm. In Western Australia the frequency of the power supply is generally 40 cycles per second, and motors for this frequency are designed to operate at 1150 rpm.

When operated under full load at the voltage and frequency for which they are designed, the temperature of ordinary motors should not rise to more than 90 degrees F. higher than the atmospheric temperature when running continuously.



In many motors, the lubrication is by means of small oil wells which are packed with oil-saturated wool yarn.

SQUIRREL CAGE MOTORS

The squirrel cage induction motor is only employed in applications where motors of about 1, 1½ or 2 hp rating are required.

The rotors in this type of motor are constructed in a similar manner to those used in condenser and capacitor-transformer motors, except that they are larger. The stator is also more sturdy and is equipped with a larger number of poles than the types already described.

The actual number of poles and method of wiring varies considerably, but they are always divided into three groups, one of which is connected to each phase of the supply. These motors have no special device to assist them in starting, and consequently their starting torque is not very great.

LUBRICATION

Most motors are equipped either with two oil wells packed with wool yarn or with two grease cups, depending on the types of bearing employed. Motors with plain bearings generally employ oil wells, which are filled with saturated wool yarn. A good quality oil, about the consistency of a light grade of crank case oil, such as used in automobile motors, is suitable. The oil wells should be filled at least every six months, and will generally require about a teaspoonful of oil. A typical oil well is shown in Fig. 3.

Motors equipped with roller or ball-bearings should have a small amount of grease added every two or three months. A high grade "medium" grease is generally suitable. Too much grease will cause the bearings to overheat, and should be avoided.

FUSE SIZE IN AMPS

TYPE (horsepower)	1/8th	1/6th	1/4th	1/3rd
Compound wound	0.9	1.2	1.8	2.5
Repulsion-Induction	1.9	2.3	3.5	4.25
Condenser	1.7	2.0	3.2	4.0

OVERLOAD PROTECTION

If a motor is overloaded or becomes defective, the current flowing through it will increase considerably. Although the motor may appear to continue operating normally, the increased current will cause the motor to heat up, and will eventually damage the insulation or burn out some part of the winding.

Care should be taken to see that the correct size of fuse is used, otherwise the motor will not be properly protected.

The above table applies only to motors operated from mains having a voltage of 230 to 250 volts, and gives an idea of suitable sizes, although where possible fuses specified by the manufacturers of the particular motor should be employed.

THE CHEMISTRY OF COOKING

(Continued from Page 10.)

about the art except to blindly follow a recipe.

Of course, most cooks, or should I be polite and say chefs? learn a lot by experience and can inform us as to what will be the result of a certain action. But few know why. It is the knowing why that enables one to maintain consistency and be in a position to invent recipes of their own, at the same time being reasonably certain of the result.

It is considerably more interesting and economical than any method of trial and error. Any person can get some flour and milk and butter and add a host of other ingredients and put it in the oven and trust to luck.

I have eaten "food" cooked by this method with unpleasant but very lasting memories.

Of course, I don't maintain that by reading this article one can become an expert cook. That would be absurd. But I hope I have shown the idea of things and, if I have started something in any household that can't be stopped, I am deeply sorry.

If any man's wife suddenly becomes technical and he has a tendency to blame me for it, I would remind him that I have written this in all good faith with due regard to his digestive functions. Let me call to mind that old but very wise saying, "the Lord sends the victuals but the devil sends the cook."

FOR YOUR DEN — MAKE THIS MODERN

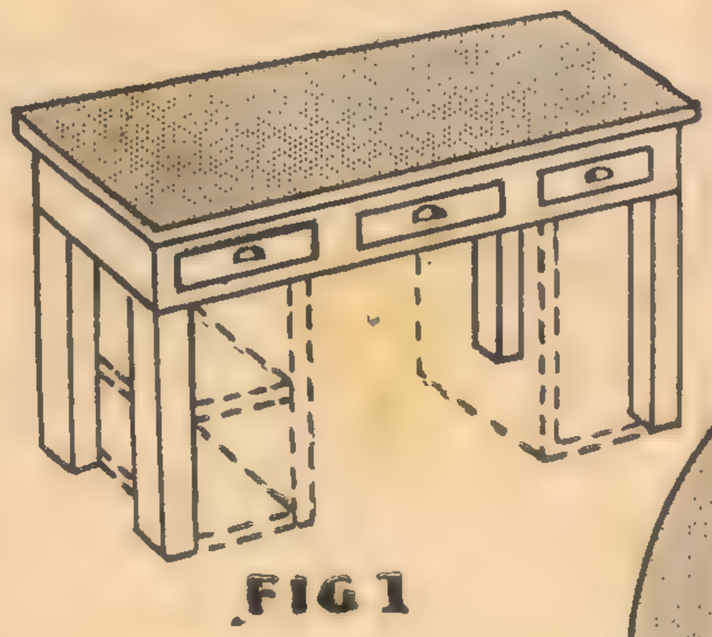
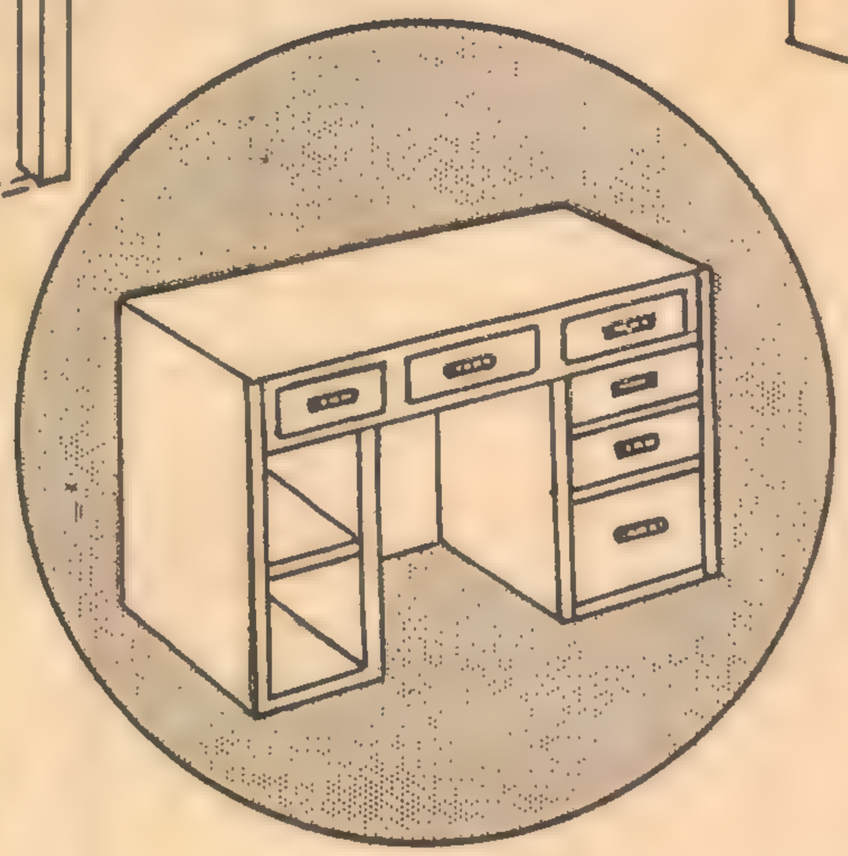


FIG 1



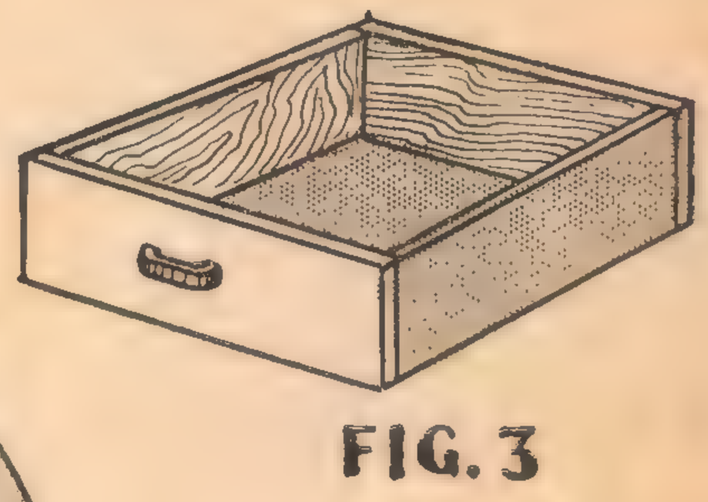


FIG. 3

FIG. 4

FIG. 2

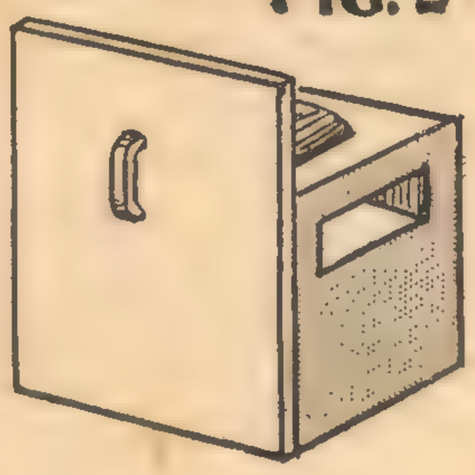
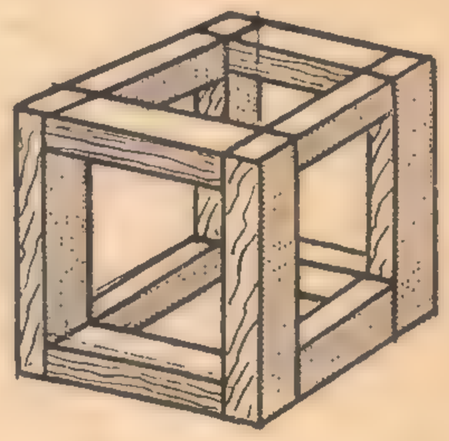


FIG. 6

FIG 5



An exceedingly useful addition to any "den" is a writing desk, and the one described in this article, as well as being very pleasing to the eye, has two additional features; it is made from an old kitchen table, which cuts down the cost as well as saving much building time, and it has been designed with a built-in chair, which saves much valuable space in the "den."

FIRST obtain an old kitchen table having two or three drawers as shown in Fig. 1. Remove the handles from the drawers and sand-paper all finish from the wood.

With a saw, cut off all hang-over of the table, top and plane till table top is flush with the four sides of the table itself, rounding the top edge of the table top slightly to give a modern finish.

The table top is usually made of soft wood and, if this is marred by dints or bumps, they can usually be removed by covering with a damp rag and ironing with a fairly hot iron.

Now, as regards the construction of the desk, actual dimensions cannot be given, as naturally these will vary with type and size of the kitchen table available.

Referring again to Fig. 1, the dotted lines show the approximate position of the partitions. Care should be taken to allow enough room between the two partitions to allow the seat to fit snugly.

In the desk actually constructed, one shelf was fitted to the left-hand partition to house a portable typewriter and filing system, and three shelves were placed in the right-hand partition to house three drawers of varying dimensions. Here, again, the constructor can build to his own requirements. The left-hand partition can be made into bookshelves if desired.

In building the drawers, of course, the best results will be obtained if the front, back and sides are dovetailed together, but, if this is a bit too stiff a proposition, or if you wish to save time on the job, a satisfactory job can be made as shown in Fig. 3.

Use not less than ½in. timber for the front, back and sides and use 1½in. countersunk screws for assembling. Drive the screws well home till the head is below the surface of the wood. Use plastic wood to fill the depressions, and sand well after the plastic wood has had time to dry.

by

W. G. Nichols

MAKING THE CHAIR

For the chair a rectangular frame is built of timber 2in. square, as shown in Fig. 5. The frame should be 1in. less in width than the opening between the two partitions in the desk. The depth should be approximately 15in., and the height sufficient to allow a comfortable sitting position.

Having made the rectangular frame, next cut from ¼in. plywood two sides, as shown in Fig. 4. The hole marked "X" is cut in both side pieces so that, after they have been nailed to the sides of the rectangular frame, a four-sided compartment can be built of half-inch timber and fitted inside the chair from one opening to the other.

This forms a handy compartment in the chair itself for keeping reference books. The idea is clearly shown in the accompanying photograph.

Next fit four castors to the bottom of the frame in such a position that the

WRITING DESK FROM AN OLD TABLE

bottom of the chair clears the floor by about ¼in. The front of the chair is filled in with ¼in. plywood, and another piece of plywood is cut to the dimensions of the opening between the partitions in the desk.

It is then attached to the back of the chair so that, when the chair is pushed into the desk, it is flush with the face of it. The seat of the chair should be upholstered for comfort.

Returning to the desk itself, a sheet of plywood should be nailed to the back and two sides of the desk, and the whole well sanded till all faces are smooth and even. All drawers and the back of the chair should be fitted with modern handles. Many pleasing designs are readily available in most hardware stores. If desired, home-made wooden handles, as shown in Fig. 6, can be fitted.

FINISHING TOUCHES

Many refinements can be added, such as a masonite top or chromed metal bands around the bottom of the drawers, but that is entirely at the discretion of the constructor.

Finally, a few hints as regards the finishing-off of the job. Remove all the handles and make sure the whole of the surfaces have been well sanded. Give the whole job a coat of filler and

If you follow the instructions set out in the accompanying article, your old kitchen table will take on the appearance of a modern writing desk. Note the chair, which fits flush with the front of the desk.

☆

when dry sand well with fine wet or dry paper.

Be sure to remove all traces of dust, and then give a coat of Dulux. When thoroughly dry again rub down with wet or dry paper. Remove all traces of dust with a soft dry cloth, and then give a final coat of Dulux, which should result in a beautiully smooth and glossy finish.

Finally, replace all handles and give the insides of the drawers a coat of light varnish stain.

Many pleasing color combinations can be had, the one used in the original was rattan, which is a light coffee color for the desk and chair, and orange and chrome handles.

The constructor can be assured that the time spent in the building of this project will be repaid a hundredfold, and any additional care taken in its construction will assure you of having something really worth while to show to your friends.

A FEW HINTS ON SOLDERING

Once upon a time one could wire up a radio receiver almost exclusively with a pair of pliers and a few lengths of busbar. Each device was duly fitted with terminals, which had the disconcerting habit of refusing to be tightened or of coming loose at the wrong moment.

NOWADAYS—and for this we are thankful—nearly all the connections in a radio receiver are soldered. The man who cannot make a soldered joint does not stand much chance as a radio home builder. Here are a few hints.

The main tool is, of course, the soldering iron. For radio work, the best iron is undoubtedly an electric iron of from 60 to 75 watts rating. A good electric iron maintains a fairly even temperature over long periods, keeps fairly clean, and will manage all normal joints.

They cost upwards of £1 to buy but are well worth while if you intend to keep on with radio as a hobby.

If you live outside the service area of the power mains or if you haven't the necessary capital for an electric iron, the alternative is an iron with a plain copper bit.

For radio work, one with a square section of from half to three-quarters of an inch is most suitable. A large iron holds the heat better but cannot be manoeuvred so easily into the odd corners of a chassis. Indeed, there is a very good argument for having two irons of different size.

An ordinary iron needs to be heated in a gas flame, over a primus stove or in the coals of a fire. When heated in a fire, the iron tends to get dirty quickly, unless wiped on a rag or bag each time it is withdrawn.

A hint, which sometimes works out well, is to have a tin or a length of pipe in the hot coals. Inside this, the iron will get hot enough without coming in contact with the ash of the fire.

The heat of the iron is important. It will not solder properly if it is too hot or too cold. If too cold, the solder will not run; if too hot, the tinning is quickly burnt off the bit. An iron is usually getting rather on the warm side when it begins to tint the flame to a bluish green.

Every soldering iron must be "tinned." This is accomplished by filing bright the tip of the bit, heating it, and, if necessary, cleaning when hot; next a little soldering flux is rubbed on the surface and a dab of solder applied. A vigorous rub with a rag moistened with flux will usually result in a bright finish. Only the tip need be tinned.

To aid in soldering, a light smear of a good flux may be applied to the surface of the wires or terminals to be joined. Do not use more flux than absolutely necessary and wipe away all excess flux after completing a joint.

Under no circumstances use "spirits of salts" in a radio chassis. The fumes will quickly rust all iron or steel parts.

For ease of work, use either resin cored solder or solder sold in strips about the thickness of fencing wire. If you are using a heavy bar of solder, chip little pieces off with your cutters.

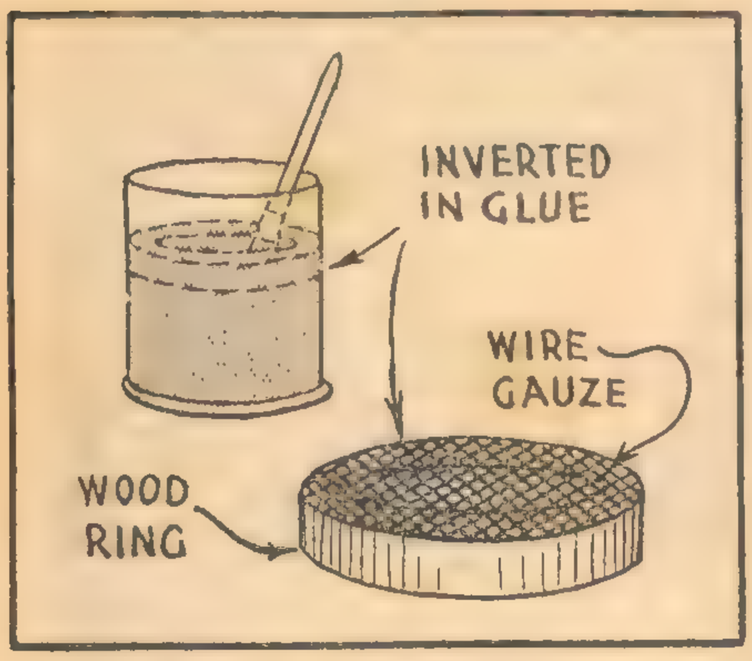
While making a joint, hold all the wires firmly in place. Use enough solder to make a neat rounded blob on the joint but do not use too much. Keep the wires rigid until the joint has hardened.

With new components and hook-up wire, the solder will usually take readily. With older components it is often necessary to scrape and tin the ends or lugs individually before attempting to make the final joint.

WORKSHOP

THE EASY WAY

By Walter G. Nichols



GLUE POT HINT

WHEN using glue or mucilage, buy a ring of light wood, such as balsa, and to one side fix a piece of wire mesh or gauze, as shown in sketch. Invert and place in glue container. In use, the weight of the brush submerges the float enough to keep the bristles moistened but keeps the handle free from glue.

JOE'S COLUMN FOR JULY

ABOUT SHARPENIN' SAWS

SHARPENIN' saws has always been considered an art, and it is not every tradesman that can turn out a good job. A man that becomes noted for turning out a good sharpenin' job will always have plenty to do. Many ambitious men have supplemented their regular earnings by filin' saws durin' their spare time. Some do the work by hand, while others without mechanical trainin' have equipped themselves with automatic saw filers. These machines handle all kinds of saws — hand saws, band saws, circular saws —in fact, any saw that can be sharpened with a three-cornered file. They work automatically, filin' all teeth to a uniform height, size and spacin'. Carpenters and other tradesmen are always quick at recognisin' a good saw-filin' job, so the important consideration, of course, is to put out only first-class work.

If you already know how to go about it, or intend to some time, the followin' tip may be useful. Before clampin' the saw in the vice, hold it teeth downwards and with the other hand move the flame of a lighted candle back and forth on the teeth. Keep at it until the teeth are all blackened, then when you place the saw in the vice and start workin' on it with a three-cornered file you will be able to clearly see the shiny bevel left by the file in contrast to the soot left by the flame. This helps to cut out eye-strain and it will be a lot easier to follow your work.

As you undoubtedly know, the teeth, in addition to being sharp, have to be alternately bent to one side to give the saw "set." It is very important that each tooth is bent the same distance. Too little would cause the saw to jam in the next cut it made, and too much would cause a rough, hard cut. After you consider that you have done a good job, remove the saw from the vice and hold it with the teeth uppermost and at a slight angle. Now place an ordinary small sewin' needle in the channel caused by the teeth being "set" up near the top and let it go. If the needle runs from one end of the saw to the other without so much as a hesitation, then you can be pretty sure that the teeth are set evenly.

A BRAIN TEASER

Here's another brain teaser. There were three men sitting one behind the other in a grandstand. The chap in the back could see the other two, the chap in the middle could only see the feller in front of him, and, of course, the chap in front couldn't see either of the others. Along comes another chap with five caps, three of them black and two white. After the three men have been told this, he goes behind them and throws away two of the caps, then he places a cap on each of the men's heads with the other three. He then asks the man in the back the color of the cap on his head. This man looks at the two caps in front of him and answers, "I don't know." The middle man is then asked, and after thinkin' he also says, "I don't know." The front man, when asked the color of the cap on his head, pauses, then says, "Black, and I can prove it."

Now you go ahead and prove how he knew he had a black cap on when he didn't see either of the others.

WORK OUT YOUR OWN MATHS

(Continued from Page 51)

The chances are that, if we tried some value for R2 other than 25,000 ohms, we would strike a more convenient value for R1. Try it for yourself!

However, let us see how the present set of values would work out. A little calculation shows that, even if the screen current did the altogether unlikely thing of falling to zero, the voltage would only rise to just over 143 volts—quite a different story to 175 volts at two milliamps, with the series resistor.

As we stated earlier, the regulation can be improved still further by arranging for a heavier bleed current. If poorer regulation can be tolerated, less bleed current will suffice.

However, in all these calculations, do not forget to check up on the wattage dissipated in the various resistors. The necessary formulae were given in the May issue. Maximum dissipation occurs in R1 under conditions of maximum screen current. In R2, the opposite is the case.

In the latter portion of this article, we have only considered the simplest case of a divider network with a single tapping. However, the same line of approach is taken irrespective of the number of different tappings. Each amount of current to be drawn from the various tappings is resolved into an equivalent resistive load and the whole treated as a series-parallel network.

ADDING AN AUDIO STAGE

(Continued from Page 43)

For headphone use, a high tension voltage of 45 volts would suffice, but, for loud-speaker reception, the full 90 volts high tension is desirable.

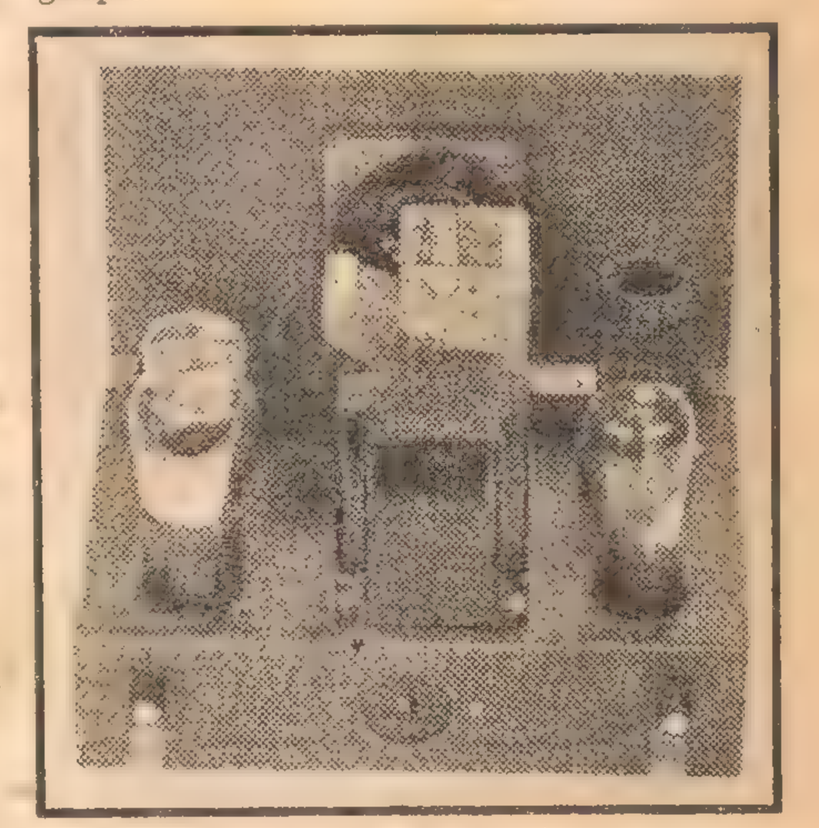
This could be obtained from batteries, from a vibrator power unit or even from a B eliminator.

By the way, if you should want to operate two or three pairs of headphones from a small receiver, connect them in series rather than in parallel, since the load on the output valve would then be more nearly equal to the optimum figure.

The detector circuit is precisely the same as in the other two-valve receiver, and in the one-valve set. Therefore, previous remarks in regards to coils, &c., apply equally to those for this receiver.

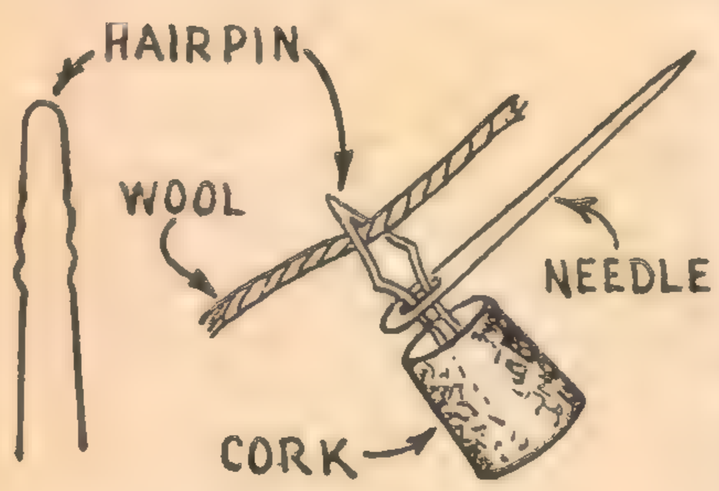
You will note that the bias battery has been eliminated, grid bias for the amplifier being provided by a back-bias system, utilising the voltage drop across a resistor connected in series with the B minus lead.

The various connections and the layout of the components in this receiver are shown in the underneath wiring diagram. The layout of the components on top of the chassis will be clear from the accompanying photograph.



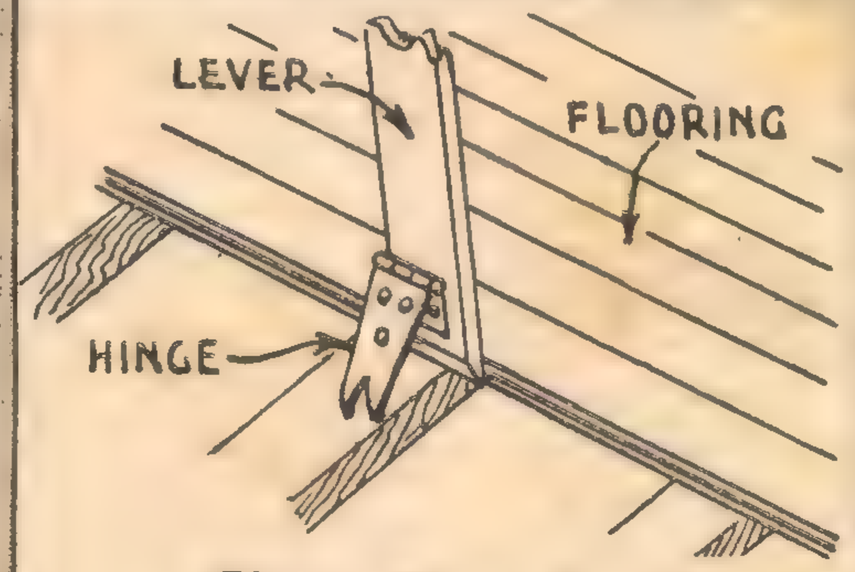
A rear view of the two valve receiver. The audio transformer shown is a modern type. Older types could be used but the tone may not be as good, depending on the characteristics.

USEFUL HINTS FOR THE HOME HANDYMAN



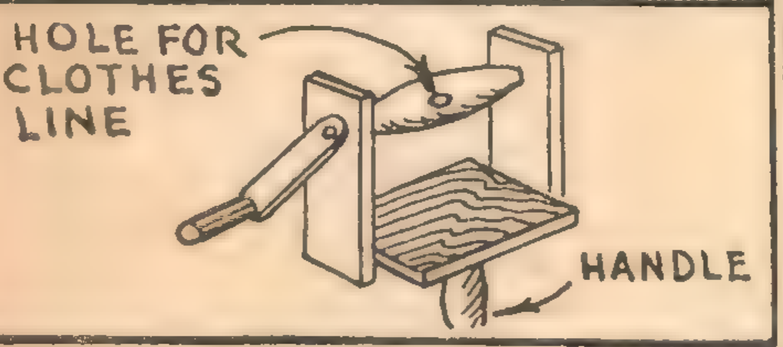
Needle Threader

It is not hard to thread a needle with wool if you use a fine wire hairpin, bent to the shape shown in sketch and inserted in a cork, to pull the wool through the eye of the needle.



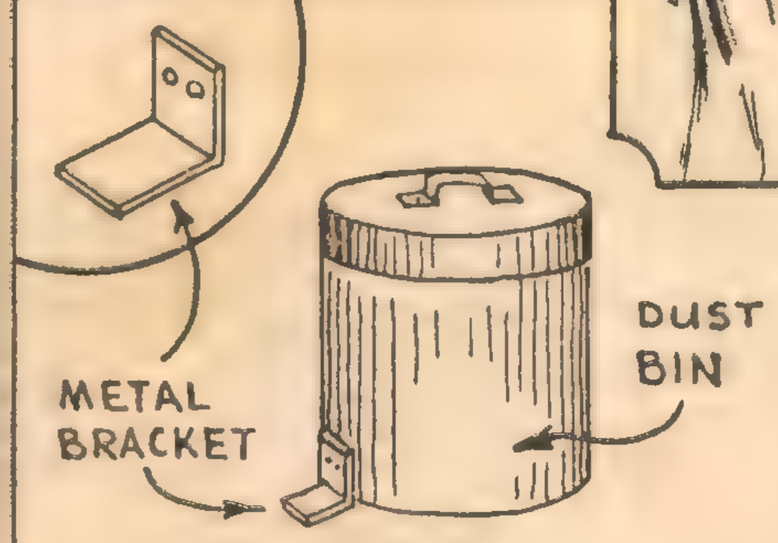
Fixing Floor Boards

This is a strong device for forcing warped flooring boards together for nailing. It consists of a wooden lever to which is screwed a fairly large hinge, with claws cut in one end, as per sketch.



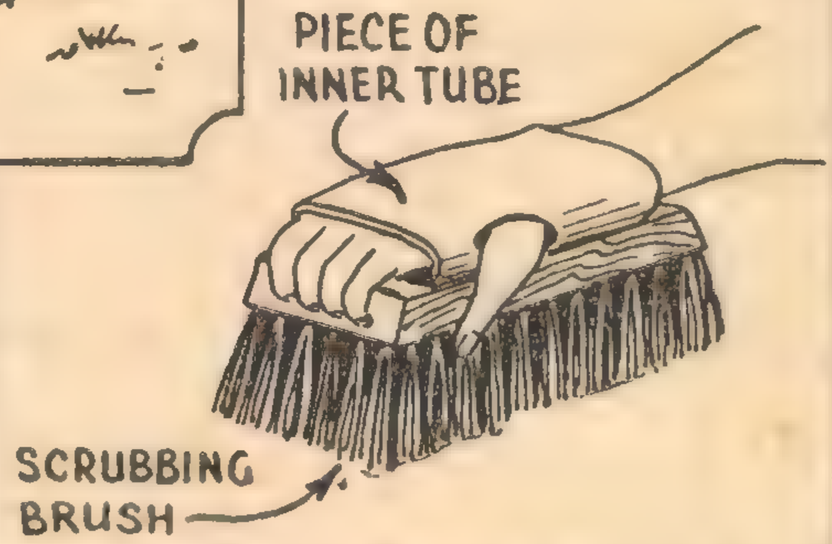
Portable Clothes Line

Made from scrap timber, this clothes line holder is simple to make, as you can see from the illustration. It is very handy where a permanent clothes line is not available.



Dust Bin Hint

Snug fitting lids on dust bins are easily removed with one hand, when fitted with a metal bracket, as shown, so that the foot can be used to hold it down, while pulling off the lid.



Relieving Hand Fatigue

By tacking a length of inner tube to the top of the scrubbing brush and cutting a hole in the tube to accommodate the thumb, the hand is relieved of the job of holding the brush and merely guides it to the required spot.

BROADCAST BAND DX

by Roy Hallett

Reports from five States indicates that present conditions for broadcast band DX are rather poor. One reporter mentions that, compared with this period last year, DX has been disappointing. Good signals are being heard, though, from Asia and New Zealand. Of the Asiatics, the Indian stations appear to be the strongest and are heard fairly consistently.

THE north Americans have been very poor, a few have been reported, particularly just after sunset below the broadcast band (between 1500 and 1600 kc).

At midnight on Saturday, May 30, the comparatively new station, 6KY, Perth, on 1430kc, broadcast a special goodwill programme for members of the New Zealand DX Club. The programme was heard fairly clearly by the writer here in Enfield. During the broadcast cheerio calls were given to some well-known DX-ers, including Mr. A. Cushen, in NZ, and Australians Dr. Gaden, Ted Tinning and others. This station usually verifies with a rather attractive QSL card.

THESE LOCATIONS

Readers may remember last month's mention of the effect various locations have upon DX. This month several reports show interesting examples of this fact. Mr. G. Obey mentions that, whilst living very close to the city of Sydney, he could obtain amazing reception from 1YA and 2YA, NZ, in daylight. He has recently moved to one of Sydney's coastal suburbs, and finds the NZ stations much poorer, and the North Americans a great deal stronger than in his former location.

A station which, according to reports, is seldom heard in the Eastern States is Saigon, on 1000kc, but DX-ers in WA report fair reception from this transmitter. The North Americans are heard usually at a much better signal strength by DX-ers on our east coast than those a few miles inland. If you see stations listed in these columns and find that you cannot raise them at your location, don't blame your radio!

Mr. W. Ramsay suggests that, after the station call-signs in our "Listen for These" column, we mention the locality at which these stations are being heard, and in some cases this suggestion has been adopted.

MYSTERY SIBERIANS

SOME Siberian statians may be heard here after midnight, and later in the morning. Mr. Suffolk is hearing one on approx. 535kc. This is unfortunately below the frequency range of most radio receivers. Other USSR stations may be heard in this part of the dial, and up to about 600kc. As far as I know, these stations do not verify.

A report from Mr. Cuffolk says that one of his pals, Mr. D. Spencer, is hearing two strangers on 690kc and 740kc. He believes them to be new New Zealanders; they carry the same programme as other NZ nationals each morning before sunrise. New Zealanders are heard opening daily at 4.0 am. No call-sign has been heard from the two strangers as yet.

CANADIANS REPORTED

Two Canadian stations have recently been heard by our reporters. Mr. Suffolk and Mr. Young are hearing CFPL, London, Ont., on 1570kc, through XEAW, Reynosa, which is on the same channel. The second is Dr. Gaden's logging, CKTB, St. Catherine, Ont., on 1550kc. These are heard late at night, but may not be heard from the time this is published till next season, towards the end of the year.

U.S. BROADCAST STATIONS

Readers may have noticed in the Press that orders were given on several nights recently that all radio stations on the Pacific Coast of North America were to close down early, in order to avoid the possibility of the Japanese Air Force using them as beacons for bombing attacks.

One of our reporters mentions that these stations have been missing the last few evenings; this is possibly the reason. The popular s.w. stations in San Francisco, KWID and KGEI, have also been missing on some recent afternoons.

READERS' REPORTS

THIS month the writer would like to thank the following readers, who have been kind enough to send along helpful DX reports:—

Mr. Obey, Bronte, NSW; Mr. Perrett, Marrickville, NSW; Mr. Ramsey, Auburn, NSW; Mr. Skelton, Queenscliff, Vic.; Mr. Norton, Swan Hill, Vic.; Mr. Schilling, NSW; Dr. Gaden, Qld.; Mr. Suffolk, Summertown, SA; Mr. Spencer, Forest Range, SA; Mr. Young, SA; Mr. Iffla, Narrakup, WA; Mr. Cushen, Invercargill, NZ; Mr. Willard, Wellington, NZ; Mr. Rhodes, Canberra, ACT; Mr. Pearson, Temora, NSW; Mr. Parsons, West Pengelly, WA; Mr. Bennett, Proserpine, Qld; Mr. Close, Gympie, Qld; Mr. Craney, Coogee, NSW; Mr. Pratt, WA; Mr. Head, Bunyip, Vic.; Mr. Cook, Vic.

LISTEN FOR THESE

HERE is our usual summary of stations likely to be heard during the next month.

ASIA

Try for these after our local stations have closed down, leaving clear channels on which these may be heard.

XGAP, Peking, China, 640kc.

XOJC, Nanking, China, 660kc (not a very strong station here).

XPRA, Kunming, China, 690kc (has news in English at midnight, but usually 6WF Perth spoils XPRA's signal).

VUT, Trichinopoly, India, 758kc.

VUC, Calcutta, India, 805kc (quite a lot of English is spoken from VUC).

HS7PJ, Bangkok, Thailand, 825kc (a strong station usually).

JBCK, Seishen, Chosen or Korea, 850kc.

VUD, Delhi, India, 886kc (not a very strong station).

XOJB, Shanghai, 900kc (fair at midnight).

Radio Saigon, Saigon, FI China, 1000kc (heard in WA).

VUW, Lucknow, India, 1022kc.

VUL, Lahore, India, 1086kc.

VUY, Dacca, India, 1167kc (usually the strongest of the Indians, heard often from around 10.45 pm. Like most Indians, VUY has a number of broadcasts in English, including the news at 1.50 pm, taken by every All-India Radio station).

XGOA, Chungking, China, 1200kc (not a very strong station; has news at midnight, rebroadcast by XPRA and s-w stations XGOY, XPSA, and XGOA).

VUB, Bombay, India, 1231kc (heard in SA).

VUM, Madras, India, 1420kc (not a very strong station).

NORTH AMERICA

These stations are very poor now, a few heard during the night include:

KFI, Los Angeles, Calif., 640kc (heard under 5CK at 10.30 pm at Enfield).

KNX, Los Angeles, 1070kc (heard under 6WB at 10.15 pm, also at Enfield).

KSL, Salt Lake City, Utah, 1160kc.

KFBK, Sacramenta, Calif, 1530kc (occasionally QRM'd by WCKY, Cincinatti).

XEAW, Reynosa, Mexico, 1570kc.

MISCELLANEOUS

IZM, Auckland, NZ, 1250kc (an NZ station not previously listed here. Heard at night).

ZJV, Suva, Fiji, 920kc (not very strong here, usually QRM'd by 2XL).

KGU, Honolulu, Hawaii, 760kc.

KGMB, Honolulu, Hawaii, 590kc, KGU and KGMB (heard 2 am).

ALL DX reports should be addressed to Mr. R. Hallett, 36 Baker-street, Enfield, NSW. Reports for the August issue should be posted to reach Mr. Hallett not later than July 4.

ANSWERS TO CORRESPONDENTS

UNDER THE PERSONAL SUPERVISION OF THE TECHNICAL EDITOR

E.H.D. (Hamilton) sends in an interesting letter with various suggestions as regards the technical features in "R. & H." We must apologise that this answer was inadvertently omitted from an earlier issue.

A: Thanks for the suggestions, EHD. We are glad to receive letters of this nature, as they let us know just what our readers want. Yes, it appears that a lot of enthusiasts will be turning over the old junk box before very much longer. In certain respects we cannot agree with you. Certainly, many of the old circuits are interesting, but, on the whole, they have been superseded simply because of the advantages offered by later developments. You say that the primary of r-f coils is tuned to no particular frequency; actually, the primary of modern coils is arranged to resonate at a frequency just below the lowest frequency covered, and serves the very useful purpose of maintaining the gain where it would normally be reduced as a result of the poorer l/c ratio. Plate tuning can give a lot of trouble with sparking when the plates of the tuning condenser collect dust. In regard to the use of valves as plate loads, if it were economically possible to obtain more gain in that way, rest assured that it would have been done long ago. You appear to attach too much importance to low resistance power supplies and fixed bias. Such considerations are important for class B and similar operation, but not for class A1 or self-bias class AB1. It is a matter of opinion whether it is worth spending extra money to achieve results which are often apparently no different to the listener. Naturally, with the final filter condenser disconnected, audio voltage appears across the field. That is one of the two main reasons for using a large final filter condenser. Finally, certain of the older coils may have had advantages from a mechanical point of view, but electrically they were not in the race.

A. Mugg (Narrikup) sends along a circuit for comment.

A: This type of circuit can be made to operate quite well if everything is adjusted to a nicety. Without knowing the value of the load into which you propose to work the valves, it is not possible to work out all the constants. In your amplifier, the screen supply resistor of the 6J7-G should be 0.5 meg., instead of 1.0 meg. The plate resistor should return to the plate circuit of the upper valve; as you have it, the feedback is positive. To excite the lower valve it would be necessary to tap off about one-fortieth of the output voltage of the upper valve; you show about one-sixth. Therefore, you will need a network of three resistors across the plate circuit of the upper valve, the first junction supplying the feedback voltage, the second the signal voltage for the lower valve. When you get things working as they should, you can expect about ten to twelve watts of power.

Unsigned (Campsie) wants the circuit of a small one-valve receiver.

A: There should be enough data in this issue to keep you interested for quite a long time.

C.N.T. (Prospect, SA) wants some information in regard to the audio choke in the Luxury Amplifier.

A: The inductance to the tapping is 0.4 henry and overall 1.0 henry. It is wound on a wooden bobbin, using either 40 SWG, SSE, DSC or even ordinary enamel wire, provided care is taken to prevent any short circuits. The 0.4 henry section will require 4520 turns and the 1.0 henry section an additional 2220 turns, making 6740 turns in all. If additional boost is required, the total inductance may be increased to 1.4 henries, in which case the total number of turns will be 7570. The bobbin consists of a ¾in. length of ¾in. dowel, with two 3¾in. cheeks cut from three-ply wood. If desired, a 57 valve may be used in place of the 6J7-G without change to the circuit constants. A permanent magnet speaker may be used with the Luxury amplifier, obviating the necessity for the separate power supply.

C.S.B. (Camperdown) asks about connecting a pick-up to a radio receiver.

A: The idea of connecting the pick-up between the grid of the second detector valve and the chassis is quite all right in some cases, but there are plenty of instances where the connection does not give the best results. It all depends on the circuit of the particular receiver. We can only suggest that you try it out and see if it works on your receiver. If it is not satisfactory, the best thing would be to write to the manufacturer of the receiver and ask their advice in the matter.

R.J. (Somewhere at Sea) reports that he disagrees with the answer to one of our maths. problems in the May issue.

A: Yes, R.J., you are quite right. The answer should have been 5.0 and not 0.5 as we had it. You probably noticed the answer to J.R.D. in the last issue; he also wrote in about the mistake.

R.W.H. (Hampden, Vic.) suggests that we should publish an article on the subject of designing power supplies for receivers and amplifiers.

A: Thanks for the encouraging remarks, R.W.H., and for the suggestion for the article. We are actually planning to run an article along these lines in the near future, although we haven't made up our minds as to the particular issue. As you say, there is certainly a need for this subject to be covered.

R.L.D. (Pagewood) sends in a circuit diagram of a short-wave converter for comment.

A: The circuit is open to criticism in many respects. The cathode bias resistor should be 300 ohms. There should be a .0001 mfd. condenser between the oscillator grid and the oscillator coil. It is desirable to include a padding condenser in series with the oscillator tuned circuit to assist in the tracking. The oscillator anode should preferably be fed through a separate 20,000 ohm dropping resistor, by-passed at the low potential end with a 0.1 mfd. by-pass condenser. The screen may be fed through a 50,000 ohm dropping resistor and by-passed to earth. The output voltage from the power supply would be far too high, as it stands, and we suggest that you connect a dropping resistor of suitable value between the filament of the rectifier and the lead to the choke and filter condenser. The high tension should be about 250 volts. We have in mind to describe a short-wave converter in the near future and you may care to wait for this. Sorry, but we cannot help at the moment in regard to the coil data.

F.J.C. (Inglewood, Qld.) renews his subscription to "R. and H." and asks two technical questions.

A: The effect of reversing the A battery connections as you show in the diagram is to reduce the effective value of the bias by an amount equal to the potential across the filament. In your case, the effective bias would now be —2.5 volts. The d-c resistance of iron wire is higher than that of copper wire. The d-c resistance of 100 feet of 20 B & S gauge copper wire is given 1.015 ohms. For SWG gauge, the resistance would be .0786 ohms. We haven't forgotten about vibrator receivers, but there is no point in describing one until the necessary parts become available for the construction.

A.G.T. (Potts Point) wants a circuit of an amplifier to make use of certain parts which he has on hand.

A: Thanks for the encouraging remarks in regard to "Radio and Hobbies." We are glad that you have found the "R. and H." designs so reliable. We do not make a practice, these times, of drawing out special circuits, although, in your case, only a very simple one is required. If you repeat your request, sending in a shilling postal note, we will see what we can do for you.

E.R.W. (Coburg, Vic.) wants some advice re using a 2500 ohm field coil where a 750 ohm one is specified.

A: Thanks for the letter and encouraging remarks. There does not seem to be any easy way out of your problem and we can only suggest the use of a separate power supply. Such a scheme was used in the Luxury amplifier, November, 1941, issue, and we refer you to this for further details. Failing this, the only other alternative would be to have the 2500 ohm field on your speaker replaced by one of 750 ohms.

L.S. (Upwey, Vic.) is puzzled about the significance of the reception code numbers R1 to R9.

A.: The so-called "R" code is an abbreviation used by listeners to convey to interested parties some idea of the signal strength of a station at the point of reception. Although a few short-wave receivers in particular have been fitted with "R" meters, the figure quoted is usually based on the opinion of the listener. The "R" code serves a useful purpose, but is often abused, on the one hand, by listeners who over-state the reception conditions, or, on the other hand, by listeners who fail to make allowance for poor receivers. An R9 signal means a signal which is steady, strong and clear, over-riding all noise and interference. An R1 signal is one which is extremely weak and barely perceptible. In between there are the other values, R2 to R8.

H.S.M. (Bridgetown, WA) expresses general appreciation of the articles in R. & H., and suggests that we should describe a short-wave receiver in the near future.

A.: Thanks for the encouraging remarks, H.S.M., and for the suggestions. We intend to keep up the Maths. articles as long as circumstances dictate. Yes, there was a mistake in one of the answers. Many people have asked about a short-wave receiver of late, and we are bearing the matter in mind. We are handicapped by lack of staff at the moment, but we will build up a receiver as soon as we possibly can.

P.J.J. (Glen Iris, Vic.) has an amplifier which is very noisy on occasions.

A.: We have checked through your circuit diagram, but there is nothing to suggest the cause of the trouble. Make sure that the valve sockets are all clean and free of flux, which may possibly have run inside the assembly. You may be able to localise the trouble by shortening out the first grid circuit, then by removing the first valve, and, finally, by disconnecting the coupling condenser to the grid of the output valve. Such steps may give you a hint to where the trouble lies. Sometimes trouble of this nature can only be finally located by temporary substitution for the various components, one at a time.

A.W.S. (Notts Well, SA) has a vibrator set which hums badly.

A.: If the trouble has only developed recently, the chances are that it is due to the drying out of one or more of the filter condensers. In this case, the cure is to replace the condensers rather than to add an additional choke. Another possibility is that the vibrator itself may need replacement. If these components are in order, an extra choke may help matters, wired either in the high tension or in the filament circuit. A filament choke may be wound on the core of an old audio transformer. The design is not at all critical, the general idea being to wind on as many turns as possible without adding unduly to the d-c resistance in the filament circuit. Time does not permit us to design a choke for you, but, offhand, we would say that it could be wound up with about 24-gauge wire. Of course, the optimum gauge would depend on the current drain of the valves and on the core dimensions; of these items we have no knowledge.

L.T. (Concord West) has a crystal set which will receive other Sydney stations only when 2UE is off the air.

A.: Lack of selectivity is one of the serious disadvantages of a crystal set. If, in your district, 2UE blankets out all the other stations, there is not a great deal you can do about it. However, you may be able to improve matters by reducing the aerial coupling or by tapping the crystal further down the tuning coil. Another possibility is to connect a wave-trap in series with the aerial and tuned to the frequency of 2UE. A wave-trap is simply an ordinary broadcast coil, parallel tuned by a .0005 variable condenser and connected in series with the aerial lead-in.

A.Mc. (Deepwater, NSW) has a battery dual-wave receiver which refuses to oscillate on the s.w. band above 25 metres. He is interested in padder feedback as a possible cure

A.: Thanks for the encouraging remarks and suggestions. Padder feedback would probably help matters, although we will have to leave the details to you. The padder on the s.w. band usually has a capacitance of about .004 mfd. To include padder feedback, you will need to arrange a 20,000 ohm series feed resistor through the coil to the oscillator plate, bypassing the junction of the resistor and oscillator coil to the hot side of the s.w. padder. You can arrange separate feed resistors to the broadcast and s.w. oscillator coils.

SHORT-WAVE REPORTS

Mr. H. Craney (Coogee, NSW): You will notice that the station you are interested in is dealt with in the notes. Always glad to hear from new correspondents.

Mr. E. Suffolk (Summertown, SA): Your opinion as regards the ABC station is much the same as mine. Write me any time.

Mr. S. Jones (Punchbowl, NSW): Thanks for the detailed report of WJQ. We have had many letters in regard to this station, and in addition have heard them ourselves. They certainly have a fine signal. Regards.

Mr. L. Matthews (Rivervale, WA): We are certainly glad to hear from you. We would be very pleased to hear from you and to get hold of a copy of your magazine. Have been trying to get one for some time. Thanks for the log. Best wishes.

Mr. R. Simpson (Concord, NSW): We were very pleased to hear from you, and were sorry we were not available to see you. You will see that we have complied with the request. Best wishes, and hope you got our letter at last. Good luck.

Mr. A. Lee (Merewether, NSW): Were wondering what had happened to you, and are glad to hear from you at last. Will look up some details on the question of bandspread for your benefit. The log shows that the sets are quite good. Write again soon.

Mr. G. Wilson (Albert Park, Vic.): Thanks for the reply to our letter, which you may be sure we will use very shortly. Glad to read that you like the section. Best wishes.

Mr. G. Latham (Warrawee, NSW): The letter was very welcome and we will endeavor to answer by post. The log is a very commendable one and speaks volumes for the set you are using. These small receivers are very intriguing.

Mr. G. Smart (South Caulfield, Vic.): We are very grateful for the information you send along, and hope that we will receive much more such dope from you. Thanks for the details on the Batavian station. Regards.

Mr. L. Walker (Applecross, WA): You are certainly very consistent with your letters and you may be sure that we are always glad to get them. The slant you give on conditions in your State are always very interesting. Thanks again.

Mr. M. Foster (Mount Vincent, NSW): Many thanks for your report and for the bulletin. We are not receiving them at the present time. The log shows the type of conditions operating at the present time.

Mr. E. Jamieson (Forreston, SA): Glad to hear from you once again. Thanks for the very nice remarks. You also send in a very fine log, which shows that you put in a fair amount of time listening to the BBC.

Mr. R. G. Gillett (Dudley Park, SA): Your letters both received on the same day. They were, however, very gratefully received. We will handle the subject of which you write as soon as possible. Thanks again.

Mrs. A. D. Wass (Carinda, NSW): Thanks for the log and the very nice letter. We are glad to hear from any of our readers. The set seems to be working very well.

Mr. R. Lean (Surrey Hills, NSW): Very glad to hear from you and to hear that you are receiving the American station. This one is a very popular one with our readers. Will welcome a report from you at any time.

Mr. A. Cushen (Invercargill, NZ): We are sorry that you are experiencing some difficulty in getting your magazine. Mails these days are a problem. Reception seems to be up to its usual standard in the Shaky Isle. Thanks for the information.

Mr. P. Cornish (Hilton, SA): We will be interested in the outcome of your inquiries as regards the station. But am afraid that we do not share your views, but the location may be more easily judged from your end. Write again soon.

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Mr. R. Hallett (Enfield, NSW): Are very glad to hear from you again. Will drop you a line soon. Thanks for the dope.

Mr. R. Francis (Erskineville, NSW): Welcome to our pages. Will be glad to hear from you from time to time. We had heard the station. In fact, we heard them on their opening night. A fairly close watch is kept here. Regards.

Mr. W. Frost (Ashbury, NSW): You were quite right, the station was not listed as we heard of it too late. We deal with it in the June issue. We note your request and will include something of that nature. Thanks.

Mr. A. T. Johnson (Maylands, WA): Thanks for letter and card. We cannot reciprocate as we do not use cards. We will reply by mail, however. Have had a letter from your friend. Your information is very welcome.

Mr. J. Baker (Ryde, NSW): The log is very good. You certainly get around a bit. The call is WJQ. Hope to hear from you soon.

Mr. J. Buckley (Goulburn, NSW): We had heard the station. Thanks. What a signal they put in here. They are as good as any of the B/C locals. These conditions seem to obtain over most of the country. We have the address you mention. Thanks again.

Mr. N. A. Hanson (Merrylands, NSW): Thanks for the prompt reply, which you will see we have used. Hope that you got our letters. The details are very interesting indeed.

Mr. A. Condon (Laura, SA): Your letter was also very gratefully received, and we thank you for the way in which you set it out. Much time is saved at this end. Will use the dope in the next issue. Regards.

Mr. H. Perkins (Malanda, Q): Thanks for the comprehensive log, which we found very useful. Have you received my letters yet? We are awaiting a reply to them. Have noted your mystery stations and hope to solve them soon.

Mr. J. Paris (Prospect, SA): Thanks for your letter. We are always glad to hear from the new listeners. Hope that the new receiver comes up to your expectations, and will be interested to hear about it and see the logs you turn in. Regards.

Mr. R. K. Clack (Beresfield, NSW): Thanks for your telegram and letter. The stations had already been heard here, but it is good to know that they are being heard in the bush. You seem to be successfully combating the interference. Best wishes.

BROADCAST DX

Max Mudie (Mount Alma, SA): Glad you are interested in the section. Yes, XEAW certainly puts over a pile of advertisements. I hope that you will be able to hear many of the stations listed in the section.

J. D. Byrne (Stanwell Park, NSW): I am pretty sure that the station you mention would be KFBK, Sacramento, 1530kc. You said it was on approx. 1540kc., and that you believed the call to be KFCK. Glad you have managed to log it. Our Editor, Mr. Williams, kindly passed your note on to me. I hope KFBK is only one of many stations you will log.

F. J. Close (near Gympie, Qld.): I'm always glad to hear from DX fans, so naturally I was pleased to receive your interesting letter. Sorry to know static is so troublesome up your way. You certainly have amazing daylight reception in your area. I also agree that the good old inverted L aerial is about as good as any.

N. B. Schilling (Wingham, NSW): Glad you were pleased to get my letter. I try to reply by mail to all DX reporters. I was interested in the details about your location; it appears to be a good one for DX. Hope your radio is running OK now.

Mr. Ern Suffolk (Summertown, SA): Those snaps were very good indeed. I noticed a copy of "R. & H." in the scene. Your very interesting letters are always welcome. You certainly have a comprehensive outfit for your DX work.

Mr. Dudly Spencer (Forest Range, SA): Thanks so much for your welcome note; you certainly have a splendid log of Europeans. I hope that when they return next season you will have similar success, and will let "R. & H." readers know what stations you are logging. Hope the new set is satisfactory.

Mr. Arthur Cusben (Invercargill, NZ): Yours is the first report received by this section from NZ. You folk certainly have amazing results with the North Americans. The NZ DX C programme from 6KY was very enjoyable; hope you heard your call.

Dr. Keith Gaden (Quilpie, Q): Your notes are always very welcome. Hope you heard your call from 6KY. Gosh! flood waters must come up pretty high up your way if they hold up air mails. . . . Hi.

Mr. W. Skelton (Queenscliff, Vic.): Thanks so much for the telegram re WJQ; it was very thoughtful of you indeed to think of us, and, believe me, we appreciate this. Shall write to you re Australian stations verifying.

Mr. Jock Willard (Wellington, NZ): Thanks so much for your very welcome note. I hope those enemy subs are not making a nuisance of themselves over your way. They have been a pest over here of late. The Australian stations appear to put in good signals across the Tasman. Your stations are excellent here at times.

Mr. George Rhodes (Canberra, ACT): Thanks ever so much for your report. DX has been rather quiet here, too, of late. Hope the earphones enable you to use your set a little more without annoying other people.

Mr. George Smart (South Caulfield, Vic.): Thanks so much for your interesting report. I noted that Mr. Whiting made use of your South African news in last month's issue of "R. & H." I shall, too, at a convenient time. I, too, am a member of the Australian DX Radio Club. The list of your loggings was also very interesting.

Mr. Harry Craney (South Coogee, NSW): Glad you have joined the All Wave All World DX Club. That mystery "ABC" station is, according to Mr. Suffolk, located in Batavia, Java, and has changed frequency. Those details of your loggings were naturally very interesting indeed.

Mr. William Ramsey (Auburn, NSW): Many thanks for your letter. Your QRA seems to be troubling you a little, too, with those Yanks. Hope the new aerial is successful. Shall probably write you by mail shortly.

Mr. W. G. Norton (Swan Hill, Vic.): Glad indeed to hear from you again. You are another DX'er interested in Aussie QSL's. Many of these are very well worth having, and they are easier to get these days than are cards from overseas stations.

Mr. D. S. Pratt (Western Australia): Your long letter was very interesting indeed. I shall write to you by mail re the various queries of yours. Glad you like "R. & H."

Mr. Cook (Victoria): Thanks a lot for that report of yours; the information contained in it was jolly interesting. Glad you enjoy reading these notes each month. I always try to make them as interesting as possible.

Mr. Graham Head (Bunyip, Vic.): Thanks very much for your interesting report. You also appear to have pretty good daylight reception. You certainly have a fine list of loggings.

Mr. Harold Parsons (West Pengelly, WA): That fine long letter from you was very welcome. Your part of the country also seems to be fairly favorable for DX. Thanks so much for the offer to send along some more of your interesting notes.

WANTED TO BUY, SELL OR EXCHANGE

WANTED, AC-DC 0-1 M.A. Meter or S.H. AC-DC Multi. Meter. For Sale, S.H. Tuning Conds., Coils, Sockets, etc. One 5V. TRF. Set (less Valves). **C. P. Hill, Pura Pura, Vic.**

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FIVE-VALVE Amplifier, P.P, 2A3's, Xtal mike, Xtal pick-up, records, 12in. speaker, 9-valve short-wave rcvr., R. meter, 3 stage, I.F., B., F.O. Both excellent order. Call or **Ring LW5576. 551 Prince's Highway, Rockdale,** Saturday, before 3 p.m.

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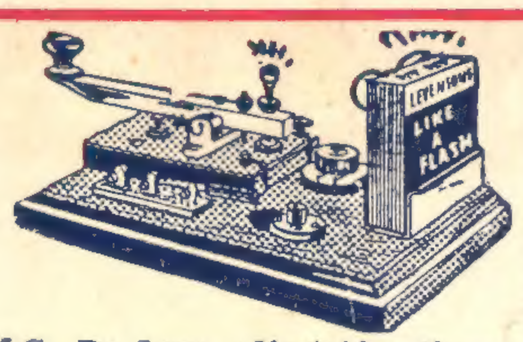
Morse Code Set, adjustable De Luxe Key, adjustable Buzzer, Switch from light to buzzer. Battery ready for use, Mounted on wooden baseboard. Neat and compact. 25/-.



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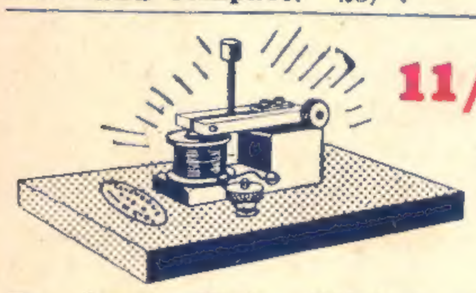
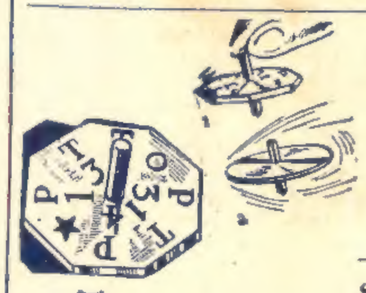
Morse Code Set. Highest grade adjustable Morse Key, P.M.G. type with super grade high tone Buzzer All mounted with battery, ready to use, 27/6. Send for Full List.

Adjustable all-way Morse Code Set, Buzzer, Battery, and all fittings, mounted ready for use on wooden baseboard, 22/6. Beautiful quality key and adjustable buzzer.

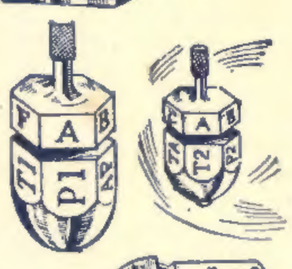


11/3

De Luxe High Pitched Buzzer. Finger tip adjustment. 11/3.



Put and Take Top, 1/6 posted.



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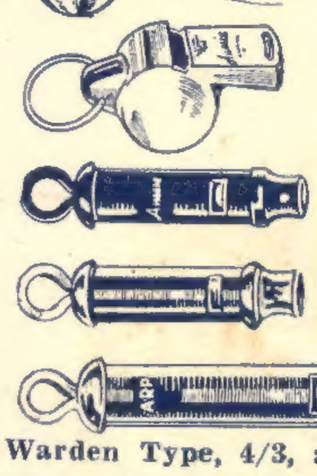

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Pick-up Heads made in England. Fit and suit all standard Tone Arms, 19/6, 22/6.

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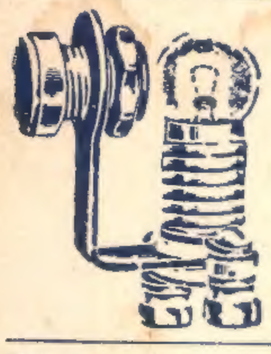

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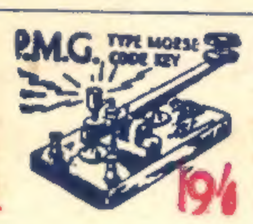

19/

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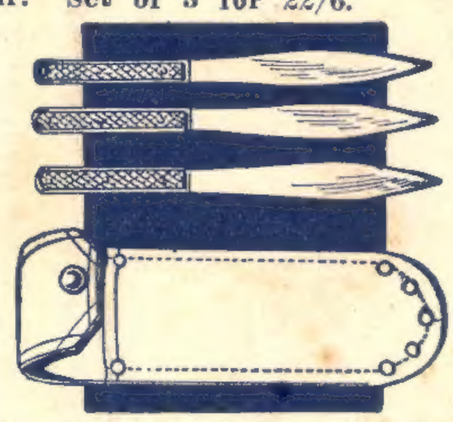

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8/9

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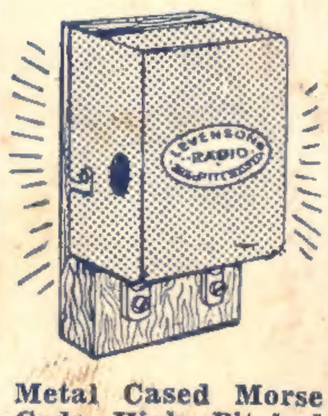

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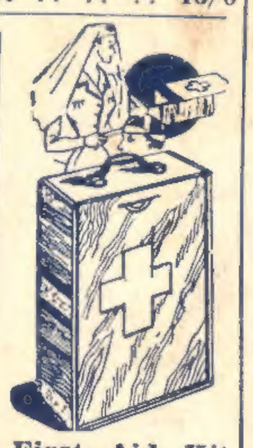

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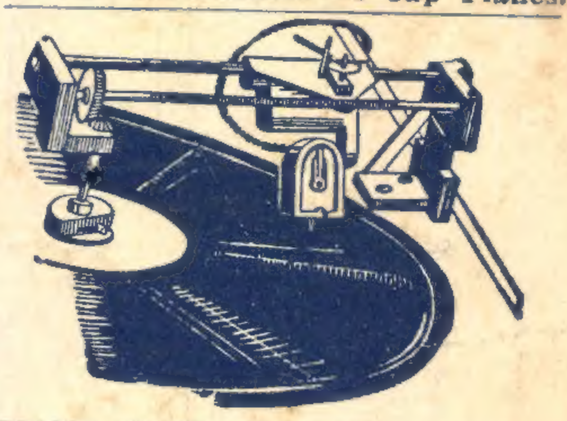

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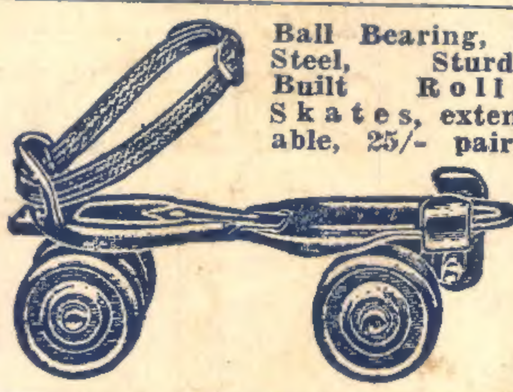

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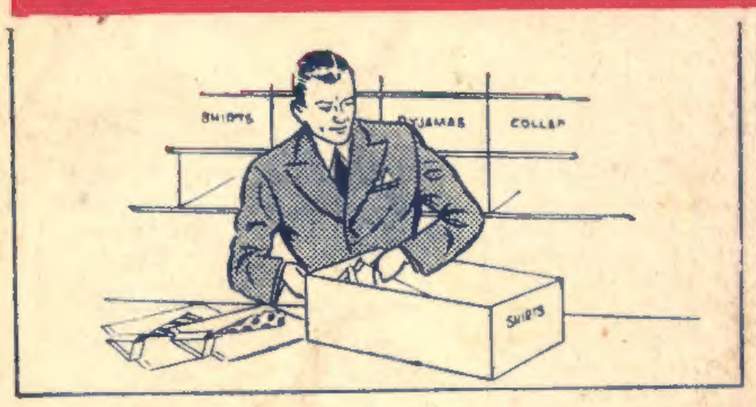
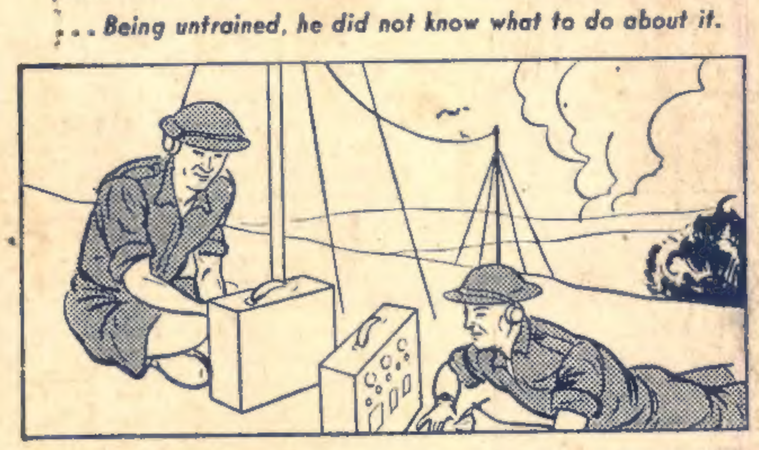
How John Stepped Out . . .



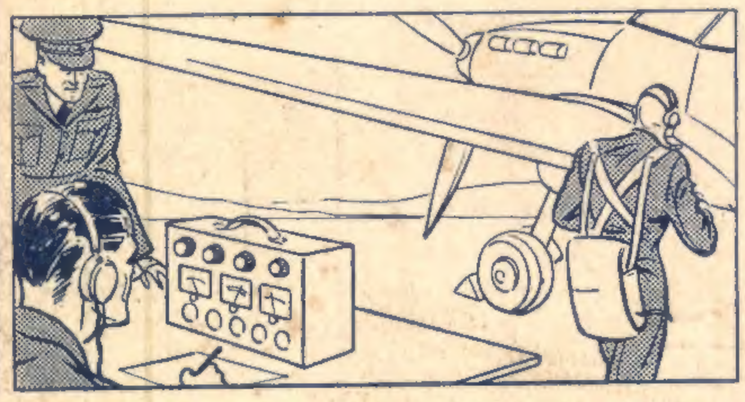
Not so very long ago, there was a young shop assistant named John, who wanted to do his best in the War effort. . . . Being untrained, he did not know what to do about it.

Until he heard about A.R.C. Radio Engineering training, and wrote for details of the course. He quickly saw the advantages of learning Radio Engineering, and started the A.R.C. course in his spare time.

John quickly learned enough to take a position at Radio Defence work, which was found for him by the College. This meant more money and good opportunities for advancement.



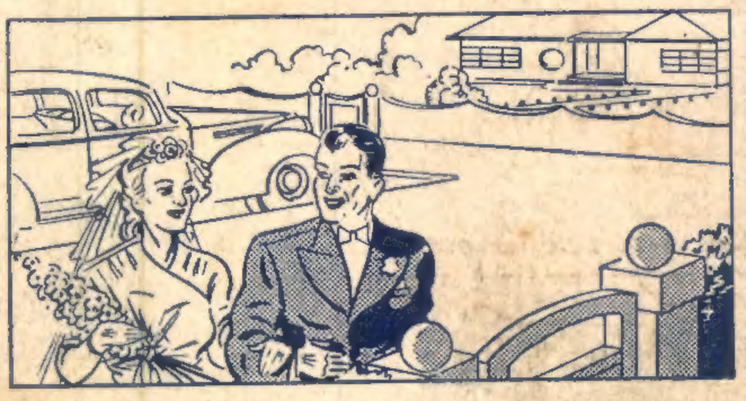
Had he wished at that time, he could have joined a Radio Unit in the Army at communications work, radio maintenance, or some other form of military radio work.



Or in the R.A.A.F. as a Radio Operator in air crew, or on the ground staff. Radio maintenance work, and radio location work, were also open to him.

Still on Defence Work, he carries on with his spare-time Radio training with the Australian Radio College. All the time making himself more and more proficient at Radio work.

Soon, by reason of his training, he is promoted to take control of his section of work. This means another rise and prospects of even more promotion.



This extra money means wedding bells for John, and a home of his own. He can see the fulfilment of his highest ambitions quickly taking shape.

When his Radio Training is completed he will be ready to take up an executive Radio position. This may come during or after the end of the War. What is most important— HIS FUTURE IS ASSURED.

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